

GraphTheorySymbol:

A set of $\text{\LaTeX}$ commands to have symbols designed for
Graph Theory

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v1.1.1 2026/08/30

Abstract

This documentation is for $\text{\LaTeX}$ package GraphTheorySymbol. It provides symbols used in graph theory. The adjacency and incidence symbols were created by the author of this package.

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1 Introduction

This documentation is for $\text{\LaTeX}$ package GraphTheorySymbol. It provides symbols used in graph theory. The adjacency and incidence symbols were created by the author of this package.

This package is licenced under Lesser GNU General Public License version 3 or later (LGPLv3+). It means you are free do anything with it, but if you do improve the code of the symbols that we provide, please do share these improvements in a similar way. There is no restriction on other graph theory symbols/code, even if it would be a good fit for inclusion in this package. There is also no need to share in a similar way what you build with this package. The text of the licenses is available at:

<https://www.gnu.org/licenses/>.

The git repository of this source code is also available at:

<https://github.com/LLyaudet/GraphTheorySymbol/>.

Clone it with this URL:

[git@github.com:LLyaudet/GraphTheorySymbol.git](https://github.com:LLyaudet/GraphTheorySymbol.git).

This is our first $\text{\LaTeX}$ package. It may be that our macros are quite slow and that a document making extensive use of these macros will be slow to compile. If you know how to produce better $\text{\LaTeX}$ code, please submit a pull request on GitHub.

2 Usage

2.1 Memo or for the impatient

Add in your preamble: `\usepackage{graph-theory-symbol}`.

Long name	Short name	Result	In context
<code>\GTSadjacency/</code>	<code>\GTSa/</code>	$\circ$	$u \circ v$
<code>\GTSadjacencyRelation/</code>	<code>\GTSaR/</code>	$\circ$	$u \circ v$
<code>\GTSunadjacency/</code>	<code>\GTSu/</code>	$\circ$	$u \circ v$
<code>\GTSunadjacencyRelation/</code>	<code>\GTSuR/</code>	$\circ$	$u \circ v$
<code>\GTSdirectedAdjacencyUp/</code>	<code>\GTSdAU/</code>	$\circ$	$u \circ v$
<code>\GTSdirectedAdjacencyUpRelation/</code>	<code>\GTSdAUR/</code>	$\circ$	$u \circ v$
<code>\GTSnegatedDirectedAdjacencyUp/</code>	<code>\GTSnDAU/</code>	$\circ$	$u \circ v$
<code>\GTSnegatedDirectedAdjacencyUpRelation/</code>	<code>\GTSnDAUR/</code>	$\circ$	$u \circ v$
<code>\GTSdirectedAdjacencyDown/</code>	<code>\GTSdAD/</code>	$\circ$	$u \circ v$
<code>\GTSdirectedAdjacencyDownRelation/</code>	<code>\GTSdADR/</code>	$\circ$	$u \circ v$
<code>\GTSnegatedDirectedAdjacencyDown/</code>	<code>\GTSnDAD/</code>	$\circ$	$u \circ v$
<code>\GTSnegatedDirectedAdjacencyDownRelation/</code>	<code>\GTSnDADR/</code>	$\circ$	$u \circ v$
<code>\GTSincidence/</code>	<code>\GTSi/</code>	$\circ$	$v \circ e$
<code>\GTSincidenceRelation/</code>	<code>\GTSiR/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedIncidence/</code>	<code>\GTSnI/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedIncidenceRelation/</code>	<code>\GTSnIR/</code>	$\circ$	$v \circ e$
<code>\GTSoutIncidence/</code>	<code>\GTSOI/</code>	$\circ$	$v \circ e$
<code>\GTSoutIncidenceRelation/</code>	<code>\GTSOIR/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedOutIncidence/</code>	<code>\GTSnOI/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedOutIncidenceRelation/</code>	<code>\GTSnOIR/</code>	$\circ$	$v \circ e$
<code>\GTSinIncidence/</code>	<code>\GTSiI/</code>	$\circ$	$v \circ e$
<code>\GTSinIncidenceRelation/</code>	<code>\GTSiIR/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedInIncidence/</code>	<code>\GTSnII/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedInIncidenceRelation/</code>	<code>\GTSnIIR/</code>	$\circ$	$v \circ e$
Long name	Short name	Result	In context
<code>\GTSadjacencyMonochrome/</code>	<code>\GTSaM/</code>	$\circ$	$u \circ v$
<code>\GTSadjacencyMonochromeRelation/</code>	<code>\GTSaMR/</code>	$\circ$	$u \circ v$
<code>\GTSunadjacencyMonochrome/</code>	<code>\GTSuM/</code>	$\circ$	$u \circ v$
<code>\GTSunadjacencyMonochromeRelation/</code>	<code>\GTSuMR/</code>	$\circ$	$u \circ v$
<code>\GTSdirectedAdjacencyUpMonochrome/</code>	<code>\GTSdAUM/</code>	$\circ$	$u \circ v$
<code>\GTSdirectedAdjacencyUpMonochromeRelation/</code>	<code>\GTSdAUMR/</code>	$\circ$	$u \circ v$
<code>\GTSnegatedDirectedAdjacencyUpMonochrome/</code>	<code>\GTSnDAUM/</code>	$\circ$	$u \circ v$
<code>\GTSnegatedDirectedAdjacencyUpMonochromeRelation/</code>	<code>\GTSnDAUMR/</code>	$\circ$	$u \circ v$
<code>\GTSdirectedAdjacencyDownMonochrome/</code>	<code>\GTSdADM/</code>	$\circ$	$u \circ v$
<code>\GTSdirectedAdjacencyDownMonochromeRelation/</code>	<code>\GTSdADMR/</code>	$\circ$	$u \circ v$
<code>\GTSnegatedDirectedAdjacencyDownMonochrome/</code>	<code>\GTSnDADM/</code>	$\circ$	$u \circ v$
<code>\GTSnegatedDirectedAdjacencyDownMonochromeRelation/</code>	<code>\GTSnDADMR/</code>	$\circ$	$u \circ v$
<code>\GTSincidenceMonochrome/</code>	<code>\GTSiM/</code>	$\circ$	$v \circ e$
<code>\GTSincidenceMonochromeRelation/</code>	<code>\GTSiMR/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedIncidenceMonochrome/</code>	<code>\GTSnIM/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedIncidenceMonochromeRelation/</code>	<code>\GTSnIMR/</code>	$\circ$	$v \circ e$
<code>\GTSoutIncidenceMonochrome/</code>	<code>\GTSOIM/</code>	$\circ$	$v \circ e$
<code>\GTSoutIncidenceMonochromeRelation/</code>	<code>\GTSOIMR/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedOutIncidenceMonochrome/</code>	<code>\GTSnOIM/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedOutIncidenceMonochromeRelation/</code>	<code>\GTSnOIMR/</code>	$\circ$	$v \circ e$
<code>\GTSinIncidenceMonochrome/</code>	<code>\GTSiIM/</code>	$\circ$	$v \circ e$
<code>\GTSinIncidenceMonochromeRelation/</code>	<code>\GTSiIMR/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedInIncidenceMonochrome/</code>	<code>\GTSnIIM/</code>	$\circ$	$v \circ e$
<code>\GTSnegatedInIncidenceMonochromeRelation/</code>	<code>\GTSnIIMR/</code>	$\circ$	$v \circ e$

\GTSsetMainColor{blue}			
Long name	Short name	Result	In context
\GTSadjacency/	\GTSa/		u v
\GTSadjacencyRelation/	\GTSaR/		u v
\GTSunadjacency/	\GTSu/		u v
\GTSunadjacencyRelation/	\GTSuR/		u v
\GTSdirectedAdjacencyUp/	\GTSdAU/		u v
\GTSdirectedAdjacencyUpRelation/	\GTSdAUR/		u v
\GTSnegatedDirectedAdjacencyUp/	\GTSnDAU/		u v
\GTSnegatedDirectedAdjacencyUpRelation/	\GTSnDAUR/		u v
\GTSdirectedAdjacencyDown/	\GTSdAD/		u v
\GTSdirectedAdjacencyDownRelation/	\GTSdADR/		u v
\GTSnegatedDirectedAdjacencyDown/	\GTSnDAD/		u v
\GTSnegatedDirectedAdjacencyDownRelation/	\GTSnDADR/		u v
\GTSincidence/	\GTSi/		v e
\GTSincidenceRelation/	\GTSiR/		v e
\GTSnegatedIncidence/	\GTSnI/		v e
\GTSnegatedIncidenceRelation/	\GTSnIR/		v e
\GTSoutIncidence/	\GTSOI/		v e
\GTSoutIncidenceRelation/	\GTSOIR/		v e
\GTSnegatedOutIncidence/	\GTSnOI/		v e
\GTSnegatedOutIncidenceRelation/	\GTSnOIR/		v e
\GTSinIncidence/	\GTSiI/		v e
\GTSinIncidenceRelation/	\GTSiIR/		v e
\GTSnegatedInIncidence/	\GTSnII/		v e
\GTSnegatedInIncidenceRelation/	\GTSnIIR/		v e

2.2 Detailed usage

First you need to add in your preamble: `\usepackage{graph-theory-symbol}`.

All symbols macros were designed with ease of use in mind: they are called with a trailing slash, they can be called in text mode or in math mode, a variant with relation spacing for math mode exists with suffix “relation”.

`\GTS@newcommand` This macro will enforce that the other macros are called with a trailing slash, avoiding problems with spaces after macro call.

Arguments:

`\{<commandname>\}` The name of the command to create.

`\{<commandcode>\}` The code of the command to create.

`\GTSsetMainColor` This macro will set the main color used in GraphTheorySymbol. This color has initial value “black”.

Argument:

`\{<color>\}` The color that must be used by GraphTheorySymbol afterward.

`\GTSsetSecondColor` This macro will set the second color used in GraphTheorySymbol. This color has initial value “gray”.

Argument:

`\{<color>\}` The color that must be used by GraphTheorySymbol afterward.

`\GTSadjacency` This macro will draw an adjacency symbol. A first drawing didn’t include the small

`\GTSa` dots in the middle of the two circles corresponding to the graph vertices. But it was too similar to “spoon” and multimap symbols, and could be confused with a graph with only two vertices and one edge. Hence, these dots were added and they have the nice property to remind of the classical textual notation of adjacency relation as $\text{Adj}(\dots)$.

$A.\GTSadjacency/A.$ or $A.\GTSa/A.$ will yield $A.\mathrel{\mathbin{\mathcal{A}}}$.

$u.\GTSadjacency/v$ or $u.\GTSa/v$ will yield $u.\mathrel{\mathbin{\mathcal{A}}}v$.

$\$u.\GTSadjacency/v\$$ or $\$u.\GTSa/v\$$ will yield $u\mathrel{\mathbin{\mathcal{A}}}v$.

`\GTSadjacencyRelation` This macro will draw an adjacency symbol.

`\GTSaR` $\$u.\GTSadjacencyRelation/v\$$ or $\$u.\GTSaR/v\$$ will yield $u.\mathrel{\mathbin{\mathcal{A}}}$.

`\GTSunadjacency` This macro will draw an unadjacency symbol.

`\GTSu` $A.\GTSunadjacency/A.$ or $A.\GTSu/A.$ will yield $A.\mathrel{\mathbin{\mathcal{U}}}$.

$u.\GTSunadjacency/v$ or $u.\GTSu/v$ will yield $u.\mathrel{\mathbin{\mathcal{U}}}v$.

$\$u.\GTSunadjacency/v\$$ or $\$u.\GTSu/v\$$ will yield $u\mathrel{\mathbin{\mathcal{U}}}v$.

`\GTSunadjacencyRelation` This macro will draw an unadjacency symbol.

`\GTSuR` $\$u.\GTSunadjacencyRelation/v\$$ or $\$u.\GTSuR/v\$$ will yield $u.\mathrel{\mathbin{\mathcal{U}}}$.

`\GTSdirectedAdjacencyUp` This macro will draw a directed adjacency upward symbol. The operand on the left of the symbol should be considered the source of the arc; the operand on the right of the symbol should be considered the target of the arc.

$A.\GTSdirectedAdjacencyUp/A.$ or $A.\GTSdAU/A.$ will yield $A.\mathrel{\mathbin{\mathcal{A}}}$.

$u.\GTSdirectedAdjacencyUp/v$ or $u.\GTSdAU/v$ will yield $u.\mathrel{\mathbin{\mathcal{A}}}v$.

$\$u.\GTSdirectedAdjacencyUp/v\$$ or $\$u.\GTSdAU/v\$$ will yield $u\mathrel{\mathbin{\mathcal{A}}}v$.

`\GTSdirectedAdjacencyUp-Relation` This macro will draw a directed adjacency upward symbol with relation spacing in math mode.

`\GTSdAUR` $\$u.\GTSdirectedAdjacencyUpRelation/v\$$ or $\$u.\GTSdAUR/v\$$ will yield $u.\mathrel{\mathbin{\mathcal{A}}}$.

`\GTSnegatedDirected-` This macro will draw a negated directed adjacency upward symbol.

`AdjacencyUp` $A.\GTSnegatedDirectedAdjacencyUp/A.$ or $A.\GTSnDAU/A.$ will yield $A.\mathrel{\mathbin{\mathcal{A}}}$.

`\GTSnDAU` $u.\GTSnegatedDirectedAdjacencyUp/v$ or $u.\GTSnDAU/v$ will yield $u.\mathrel{\mathbin{\mathcal{A}}}v$.

$\$u.\GTSnegatedDirectedAdjacencyUp/v\$$ or $\$u.\GTSnDAU/v\$$ will yield $u\mathrel{\mathbin{\mathcal{A}}}v$.

`\GTSnegatedDirected-AdjacencyUpRelation` This macro will draw a negated directed adjacency upward symbol with relation spacing in math mode.

`\GTSnDAUR` $\$u.\GTSnegatedDirectedAdjacencyUpRelation/v\$$ or $\$u.\GTSnDAUR/v\$$ will yield $u.\mathrel{\mathbin{\mathcal{A}}}$.

`\GTSdirectedAdjacencyDown` This macro will draw a directed adjacency downward symbol. The operand on the left of the symbol should be considered the target of the arc; the operand on the right of the symbol should be considered the source of the arc.

$A.\GTSdirectedAdjacencyDown/A.$ or $A.\GTSdAD/A.$ will yield $A.\mathrel{\mathbin{\mathcal{A}}}$.

$u.\GTSdirectedAdjacencyDown/v$ or $u.\GTSdAD/v$ will yield $u.\mathrel{\mathbin{\mathcal{A}}}v$.

$\$u.\GTSdirectedAdjacencyDown/v\$$ or $\$u.\GTSdAD/v\$$ will yield $u\mathrel{\mathbin{\mathcal{A}}}v$.

`\GTSdirectedAdjacencyDown-Relation` This macro will draw a directed adjacency downward symbol with relation spacing in math mode.

`\GTSdADR` $\$u.\GTSdirectedAdjacencyDownRelation/v\$$ or $\$u.\GTSdADR/v\$$ will yield $u.\mathrel{\mathbin{\mathcal{A}}}$.

`\GTSnegatedDirected-` This macro will draw a negated directed adjacency downward symbol.

`AdjacencyDown`

`\GTSnDAD`

$A.\backslash\text{GTSnegatedDirectedAdjacencyDown}/A.$ or $A.\backslash\text{GTSnDAD}/A.$ will yield $A.\text{\textcircled{A}}$.
 $u\backslash\text{GTSnegatedDirectedAdjacencyDown}/v$ or $u\backslash\text{GTSnDAD}/v$ will yield $u\text{\textcircled{v}}$.
 $\$u\backslash\text{GTSnegatedDirectedAdjacencyDown}/v\$$ or $\$u\backslash\text{GTSnDAD}/v\$$ will yield $u\text{\textcircled{v}}$.

$\backslash\text{GTSnegatedDirectedAdjacencyDownRelation}$ This macro will draw a negated directed adjacency downward symbol with relation spacing in math mode.
 $\backslash\text{GTSnDADR}$ $\$u\backslash\text{GTSnegatedDirectedAdjacencyDownRelation}/v\$$ or $\$u\backslash\text{GTSnDADR}/v\$$ will yield $u\text{\textcircled{v}}$.

$\backslash\text{GTSincidence}$ This macro will draw an incidence symbol. The operand on the left of the symbol should be considered the vertex to which the edge/the operand on the right of the symbol is incident.
 $\backslash\text{GTSi}$ $A.\backslash\text{GTSincidence}/A.$ or $A.\backslash\text{GTSi}/A.$ will yield $A.\text{\textcircled{A}}$.
 $v\backslash\text{GTSincidence}/e$ or $v\backslash\text{GTSi}/e$ will yield $v\text{\textcircled{e}}$.
 $\$v\backslash\text{GTSincidence}/e\$$ or $\$v\backslash\text{GTSi}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSincidenceRelation}$ This macro will draw an incidence symbol with relation spacing in math mode.
 $\backslash\text{GTSiR}$ $\$v\backslash\text{GTSincidenceRelation}/e\$$ or $\$v\backslash\text{GTSiR}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSnegatedIncidence}$ This macro will draw a negated incidence symbol.
 $\backslash\text{GTSnI}$ $A.\backslash\text{GTSnegatedIncidence}/A.$ or $A.\backslash\text{GTSnI}/A.$ will yield $A.\text{\textcircled{A}}$.
 $v\backslash\text{GTSnegatedIncidence}/e$ or $v\backslash\text{GTSnI}/e$ will yield $v\text{\textcircled{e}}$.
 $\$v\backslash\text{GTSnegatedIncidence}/e\$$ or $\$v\backslash\text{GTSnI}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSnegatedIncidenceRelation}$ This macro will draw a negated incidence symbol with relation spacing in math mode.
 $\backslash\text{GTSnIR}$ $\$v\backslash\text{GTSnegatedIncidenceRelation}/e\$$ or $\$v\backslash\text{GTSnIR}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSoutIncidence}$ This macro will draw a directed incidence upward (out(ward) incidence) symbol. The operand on the left of the symbol should be considered the vertex to which the arc/the operand on the right of the symbol is incident.
 $\backslash\text{GTSOI}$ $A.\backslash\text{GTSoutIncidence}/A.$ or $A.\backslash\text{GTSOI}/A.$ will yield $A.\text{\textcircled{A}}$.
 $v\backslash\text{GTSoutIncidence}/e$ or $v\backslash\text{GTSOI}/e$ will yield $v\text{\textcircled{e}}$.
 $\$v\backslash\text{GTSoutIncidence}/e\$$ or $\$v\backslash\text{GTSOI}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSoutIncidenceRelation}$ This macro will draw a directed incidence upward (out(ward) incidence) symbol with relation spacing in math mode.
 $\backslash\text{GTSOIR}$ $\$v\backslash\text{GTSoutIncidenceRelation}/e\$$ or $\$v\backslash\text{GTSOIR}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSnegatedOutIncidence}$ This macro will draw a negated directed incidence upward (out(ward) incidence) symbol.
 $\backslash\text{GTSnOI}$ $A.\backslash\text{GTSnegatedOutIncidence}/A.$ or $A.\backslash\text{GTSnOI}/A.$ will yield $A.\text{\textcircled{A}}$.
 $v\backslash\text{GTSnegatedOutIncidence}/e$ or $v\backslash\text{GTSnOI}/e$ will yield $v\text{\textcircled{e}}$.
 $\$v\backslash\text{GTSnegatedOutIncidence}/e\$$ or $\$v\backslash\text{GTSnOI}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSnegatedOutIncidenceRelation}$ This macro will draw a negated directed incidence upward (out(ward) incidence) symbol with relation spacing in math mode.
 $\backslash\text{GTSnOIR}$ $\$v\backslash\text{GTSnegatedOutIncidenceRelation}/e\$$ or $\$v\backslash\text{GTSnOIR}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSinIncidence}$ This macro will draw a directed incidence downward (in(ward) incidence) symbol. The operand on the left of the symbol should be considered the vertex to which the arc/the operand on the right of the symbol is incident.
 $\backslash\text{GTSiI}$ $A.\backslash\text{GTSinIncidence}/A.$ or $A.\backslash\text{GTSiI}/A.$ will yield $A.\text{\textcircled{A}}$.
 $v\backslash\text{GTSinIncidence}/e$ or $v\backslash\text{GTSiI}/e$ will yield $v\text{\textcircled{e}}$.
 $\$v\backslash\text{GTSinIncidence}/e\$$ or $\$v\backslash\text{GTSiI}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSinIncidenceRelation}$ This macro will draw a directed incidence downward (in(ward) incidence) symbol with relation spacing in math mode.
 $\backslash\text{GTSiIR}$ $\$v\backslash\text{GTSinIncidenceRelation}/e\$$ or $\$v\backslash\text{GTSiIR}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSnegatedInIncidence}$ This macro will draw a negated directed incidence downward (in(ward) incidence) symbol.
 $\backslash\text{GTSnII}$ $A.\backslash\text{GTSnegatedInIncidence}/A.$ or $A.\backslash\text{GTSnII}/A.$ will yield $A.\text{\textcircled{A}}$.
 $v\backslash\text{GTSnegatedInIncidence}/e$ or $v\backslash\text{GTSnII}/e$ will yield $v\text{\textcircled{e}}$.
 $\$v\backslash\text{GTSnegatedInIncidence}/e\$$ or $\$v\backslash\text{GTSnII}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSnegatedInIncidenceRelation}$ This macro will draw a negated directed incidence downward (in(ward) incidence) symbol with relation spacing in math mode.
 $\backslash\text{GTSnIIR}$ $\$v\backslash\text{GTSnegatedInIncidenceRelation}/e\$$ or $\$v\backslash\text{GTSnIIR}/e\$$ will yield $v\text{\textcircled{e}}$.

$\backslash\text{GTSadjacencyMonochrome}$ This macro will draw a monochrome adjacency symbol.
 $\backslash\text{GTSaM}$ $A.\backslash\text{GTSadjacencyMonochrome}/A.$ or $A.\backslash\text{GTSaM}/A.$ will yield $A.\text{\textcircled{A}}$.
 $u\backslash\text{GTSadjacencyMonochrome}/v$ or $u\backslash\text{GTSaM}/v$ will yield $u\text{\textcircled{v}}$.
 $\$u\backslash\text{GTSadjacencyMonochrome}/v\$$ or $\$u\backslash\text{GTSaM}/v\$$ will yield $u\text{\textcircled{v}}$.

$\backslash\text{GTSadjacencyMonochromeRelation}$ This macro will draw a monochrome adjacency symbol with relation spacing in math mode.
 $\backslash\text{GTSaMR}$ $\$u\backslash\text{GTSadjacencyMonochromeRelation}/v\$$ or $\$u\backslash\text{GTSaMR}/v\$$ will yield $u\text{\textcircled{v}}$.

`\GTSunadjacencyMonochrome` This macro will draw a monochrome unadjacency symbol.

`\GTSuM` `A.\GTSunadjacencyMonochrome/A.` or `A.\GTSuM/A.` will yield $A.\overset{\circ}{\underset{\circ}{\parallel}}A.$
`u \GTSunadjacencyMonochrome/ v` or `u \GTSuM/ v` will yield $u \overset{\circ}{\underset{\circ}{\parallel}} v.$
`$u \GTSunadjacencyMonochrome/ v$` or `$u \GTSuM/ v$` will yield $u \overset{\circ}{\underset{\circ}{\parallel}} v.$

`\GTSunadjacencyMonochrome-` This macro will draw a monochrome unadjacency symbol with relation spacing in
`Relation` math mode.
`\GTSuMR` `$u\GTSunadjacencyMonochromeRelation/v$` or `$u\GTSuMR/v$` will yield $u \overset{\circ}{\underset{\circ}{\parallel}} v.$

`\GTSdirectedAdjacencyUp-` This macro will draw a monochrome directed adjacency upward symbol. The operand
`Monochrome` on the left of the symbol should be considered the source of the arc; the operand on the
`\GTSdAUM` right of the symbol should be considered the target of the arc.
`A.\GTSdirectedAdjacencyUpMonochrome/A.` or `A.\GTSdAUM/A.` will yield $A.\overset{\circ}{\underset{\circ}{\nearrow}}A.$
`u \GTSdirectedAdjacencyUpMonochrome/ v` or `u \GTSdAUM/ v` will yield $u \overset{\circ}{\underset{\circ}{\nearrow}} v.$
`$u \GTSdirectedAdjacencyUpMonochrome/ v$` or `$u \GTSdAUM/ v$` will yield $u \overset{\circ}{\underset{\circ}{\nearrow}} v.$

`\GTSdirectedAdjacencyUp-` This macro will draw a monochrome directed adjacency upward symbol with relation
`MonochromeRelation` spacing in math mode.
`\GTSdAUMR` `$u\GTSdirectedAdjacencyUpMonochromeRelation/v$` or `$u\GTSdAUMR/v$` will yield $u \overset{\circ}{\underset{\circ}{\nearrow}} v.$

`\GTSnegatedDirected-` This macro will draw a monochrome negated directed adjacency upward symbol.
`AdjacencyUpMonochrome` `A.\GTSnegatedDirectedAdjacencyUpMonochrome/A.` or `A.\GTSnDAUM/A.` will yield $A.\overset{\circ}{\underset{\circ}{\nearrow}}A.$
`\GTSnDAUM` `u \GTSnegatedDirectedAdjacencyUpMonochrome/ v` or `u \GTSnDAUM/ v` will yield $u \overset{\circ}{\underset{\circ}{\nearrow}} v.$
`$u \GTSnegatedDirectedAdjacencyUpMonochrome/ v$` or `$u \GTSnDAUM/ v$` will yield $u \overset{\circ}{\underset{\circ}{\nearrow}} v.$

`\GTSnegatedDirected-` This macro will draw a monochrome negated directed adjacency upward symbol with
`AdjacencyUpMonochrome-` relation spacing in math mode.
`Relation` `$u\GTSnegatedDirectedAdjacencyUpMonochromeRelation/v$` or `$u\GTSnDAUMR/v$` will
`\GTSnDAUMR` yield $u \overset{\circ}{\underset{\circ}{\nearrow}} v.$

`\GTSdirectedAdjacencyDown-` This macro will draw a monochrome directed adjacency downward symbol. The
`Monochrome` operand on the left of the symbol should be considered the target of the arc; the operand
`\GTSdADM` on the right of the symbol should be considered the source of the arc.
`A.\GTSdirectedAdjacencyDownMonochrome/A.` or `A.\GTSdADM/A.` will yield $A.\overset{\circ}{\underset{\circ}{\searrow}}A.$
`u \GTSdirectedAdjacencyDownMonochrome/ v` or `u \GTSdADM/ v` will yield $u \overset{\circ}{\underset{\circ}{\searrow}} v.$
`$u \GTSdirectedAdjacencyDownMonochrome/ v$` or `$u \GTSdADM/ v$` will yield $u \overset{\circ}{\underset{\circ}{\searrow}} v.$

`\GTSdirectedAdjacencyDown-` This macro will draw a monochrome directed adjacency downward symbol with relation
`MonochromeRelation` spacing in math mode.
`\GTSdADMR` `$u\GTSdirectedAdjacencyDownMonochromeRelation/v$` or `$u\GTSdADMR/v$`
will yield $u \overset{\circ}{\underset{\circ}{\searrow}} v.$

`\GTSnegatedDirected-` This macro will draw a monochrome negated directed adjacency downward symbol.
`AdjacencyDownMonochrome` `A.\GTSnegatedDirectedAdjacencyDownMonochrome/A.` or `A.\GTSnDADM/A.` will yield $A.\overset{\circ}{\underset{\circ}{\searrow}}A.$
`\GTSnDADM` `u \GTSnegatedDirectedAdjacencyDownMonochrome/ v` or `u \GTSnDADM/ v` will yield $u \overset{\circ}{\underset{\circ}{\searrow}} v.$
`$u \GTSnegatedDirectedAdjacencyDownMonochrome/ v$` or `$u \GTSnDADM/ v$` will yield $u \overset{\circ}{\underset{\circ}{\searrow}} v.$

`\GTSnegatedDirected-` This macro will draw a monochrome negated directed adjacency downward symbol
`AdjacencyDownMonochrome-` with relation spacing in math mode.
`Relation` `$u\GTSnegatedDirectedAdjacencyDownMonochromeRelation/v$` or `$u\GTSnDADMR/v$` will
`\GTSnDADMR` yield $u \overset{\circ}{\underset{\circ}{\searrow}} v.$

`\GTSincidenceMonochrome` This macro will draw a monochrome incidence symbol. The operand on the left of the
`\GTSiM` symbol should be considered the vertex to which the edge/the operand on the right of the
symbol is incident.
`A.\GTSincidenceMonochrome/A.` or `A.\GTSiM/A.` will yield $A.\overset{\circ}{\underset{\circ}{\downarrow}}A.$
`v \GTSincidenceMonochrome/ e` or `v \GTSiM/ e` will yield $v \overset{\circ}{\underset{\circ}{\downarrow}} e.$
`$v \GTSincidenceMonochrome/ e$` or `$v \GTSiM/ e$` will yield $v \overset{\circ}{\underset{\circ}{\downarrow}} e.$

`\GTSincidenceMonochrome-` This macro will draw a monochrome incidence symbol with relation spacing in math
`Relation` mode. `$v\GTSincidenceMonochromeRelation/e$` or `$v\GTSiMR/e$` will yield $v \overset{\circ}{\underset{\circ}{\downarrow}} e.$
`\GTSiMR` This macro will draw a monochrome negated incidence symbol.

`\GTSnegatedIncidence-` `A.\GTSnegatedIncidenceMonochrome/A.` or `A.\GTSnIM/A.` will yield $A.\overset{\circ}{\underset{\circ}{\downarrow}}A.$
`Monochrome` `v \GTSnegatedIncidenceMonochrome/ e` or `v \GTSnIM/ e` will yield $v \overset{\circ}{\underset{\circ}{\downarrow}} e.$
`\GTSnIM` `$v \GTSnegatedIncidenceMonochrome/ e$` or `$v \GTSnIM/ e$` will yield $v \overset{\circ}{\underset{\circ}{\downarrow}} e.$

`\GTSnegatedIncidence-` This macro will draw a monochrome negated incidence symbol with relation spacing
`MonochromeRelation` in math mode.
`\GTSnIMR` `$v\GTSnegatedIncidenceMonochromeRelation/e$` or `$v\GTSnIMR/e$` will yield $v \overset{\circ}{\underset{\circ}{\downarrow}} e.$

`\GTSoutIncidenceMonochrome` This macro will draw a monochrome directed incidence upward (out(ward) incidence)
`\GTSoIM`

symbol. The operand on the left of the symbol should be considered the vertex to which the arc/the operand on the right of the symbol is incident.

$A.\backslash\text{GTSoutIncidenceMonochrome}/A.$ or $A.\backslash\text{GTSoIM}/A.$ will yield $A.\textcircled{\uparrow}A.$

$v \backslash\text{GTSoutIncidenceMonochrome}/ e$ or $v \backslash\text{GTSoIM}/ e$ will yield $v \textcircled{\uparrow} e.$

$\$v \backslash\text{GTSoutIncidenceMonochrome}/ e\$$ or $\$v \backslash\text{GTSoIM}/ e\$$ will yield $v \textcircled{\uparrow} e.$

$\backslash\text{GTSoutIncidenceMonochrome-Relation}$ This macro will draw a monochrome directed incidence upward (out(ward) incidence) symbol with relation spacing in math mode.

$\backslash\text{GTSoIMR}$ $\$v \backslash\text{GTSoutIncidenceMonochromeRelation}/ e\$$ or $\$v \backslash\text{GTSoIMR}/ e\$$ will yield $v \textcircled{\uparrow} e.$

$\backslash\text{GTSnegatedOutIncidence-Monochrome}$ This macro will draw a monochrome negated directed incidence upward (out(ward) incidence) symbol.

$\backslash\text{GTSnOIM}$ $A.\backslash\text{GTSnegatedOutIncidenceMonochrome}/A.$ or $A.\backslash\text{GTSnOIM}/A.$ will yield $A.\textcircled{\uparrow}A.$

$v \backslash\text{GTSnegatedOutIncidenceMonochrome}/ e$ or $v \backslash\text{GTSnOIM}/ e$ will yield $v \textcircled{\uparrow} e.$

$\$v \backslash\text{GTSnegatedOutIncidenceMonochrome}/ e\$$ or $\$v \backslash\text{GTSnOIM}/ e\$$ will yield $v \textcircled{\uparrow} e.$

$\backslash\text{GTSnegatedOutIncidence-MonochromeRelation}$ This macro will draw a monochrome negated directed incidence upward (out(ward) incidence) symbol with relation spacing in math mode.

$\backslash\text{GTSnOIMR}$ $\$v \backslash\text{GTSnegatedOutIncidenceMonochromeRelation}/ e\$$ or $\$v \backslash\text{GTSnOIMR}/ e\$$ will yield $v \textcircled{\uparrow} e.$

$\backslash\text{GTSinIncidenceMonochrome}$ This macro will draw a monochrome directed incidence downward (in(ward) incidence) symbol. The operand on the left of the symbol should be considered the vertex to which the arc/the operand on the right of the symbol is incident.

$A.\backslash\text{GTSinIncidenceMonochrome}/A.$ or $A.\backslash\text{GTSiIM}/A.$ will yield $A.\textcircled{\downarrow}A.$

$v \backslash\text{GTSinIncidenceMonochrome}/ e$ or $v \backslash\text{GTSiIM}/ e$ will yield $v \textcircled{\downarrow} e.$

$\$v \backslash\text{GTSinIncidenceMonochrome}/ e\$$ or $\$v \backslash\text{GTSiIM}/ e\$$ will yield $v \textcircled{\downarrow} e.$

$\backslash\text{GTSinIncidenceMonochrome-Relation}$ This macro will draw a monochrome directed incidence downward (in(ward) incidence) symbol with relation spacing in math mode.

$\backslash\text{GTSiIMR}$ $\$v \backslash\text{GTSinIncidenceMonochromeRelation}/ e\$$ or $\$v \backslash\text{GTSiIMR}/ e\$$ will yield $v \textcircled{\downarrow} e.$

$\backslash\text{GTSnegatedInIncidence-Monochrome}$ This macro will draw a monochrome negated directed incidence downward (in(ward) incidence) symbol.

$\backslash\text{GTSnIIM}$ $A.\backslash\text{GTSnegatedInIncidenceMonochrome}/A.$ or $A.\backslash\text{GTSnIIM}/A.$ will yield $A.\textcircled{\downarrow}A.$

$v \backslash\text{GTSnegatedInIncidenceMonochrome}/ e$ or $v \backslash\text{GTSnIIM}/ e$ will yield $v \textcircled{\downarrow} e.$

$\$v \backslash\text{GTSnegatedInIncidenceMonochrome}/ e\$$ or $\$v \backslash\text{GTSnIIM}/ e\$$ will yield $v \textcircled{\downarrow} e.$

$\backslash\text{GTSnegatedInIncidence-MonochromeRelation}$ This macro will draw a monochrome negated directed incidence downward (in(ward) incidence) symbol with relation spacing in math mode.

$\backslash\text{GTSnIIMR}$ $\$v \backslash\text{GTSnegatedInIncidenceMonochromeRelation}/ e\$$ or $\$v \backslash\text{GTSnIIMR}/ e\$$ will yield $v \textcircled{\downarrow} e.$

3 Implementation

```

1 < *package>
2 \RequirePackage{amsmath}
3 \RequirePackage{amssymb}
4 \RequirePackage{graphicx}
5 \RequirePackage{fdsymbol}
6 \RequirePackage{lua-unicode-math}
7 \RequirePackage{xcolor}
8
9 \def \GTS@mainColor {black}
10 \def \GTS@secondColor {gray}
11 \def \GTS@mainColorBackup {black}
12 \def \GTS@secondColorBackup {gray}
13 \def \GTS@drawSlash {}
14 \def \GTS@drawUpArrow {}
15 \def \GTS@drawDownArrow {}
16

```

$\backslash\text{GTS@newcommand}$ This macro will enforce that the other macros are called with a trailing slash, avoiding problems with spaces after macro call.

Arguments:

$\{<commandname>\}$ The name of the command to create.

$\{<commandcode>\}$ The code of the command to create.

```

17 \@ifdefinable{\GTS@newcommand}{\def\GTS@newcommand#1#2{%
18   \@ifdefinable{#1}{\def#1/{#2}}
19 }}

```

`\GTSsetMainColor` This macro will set the main color used in `GraphTheorySymbol`. This color has initial value “black”.

Argument:
`{(color)}` The color that must be used by `GraphTheorySymbol` afterward.

```

20 \newcommand{\GTSsetMainColor}[1]{%
21 \edef\GTS@mainColorTemp{#1}%
22 \edef\GTS@mainColorBackup{\GTS@mainColor}%
23 \edef\GTS@mainColor{\GTS@mainColorTemp}%
24 }
```

`\GTSsetSecondColor` This macro will set the second color used in `GraphTheorySymbol`. This color has initial value “gray”.

Argument:
`{(color)}` The color that must be used by `GraphTheorySymbol` afterward.

```

25 \newcommand{\GTSsetSecondColor}[1]{%
26 \edef\GTS@secondColorTemp{#1}%
27 \edef\GTS@secondColorBackup{\GTS@secondColor}%
28 \edef\GTS@secondColor{\GTS@secondColorTemp}%
29 }
```

`\GTSadjacency` This macro will draw an adjacency symbol.

`\GTSa`

```

30 \GTS@newcommand{\GTSadjacency}{%
31 \text{\ensuremath{%
32 \raisebox{-0.2ex}{\scalebox{1.5}[1.5]{%
33 %
34 \raisebox{0.7ex}{\scalebox{0.7}[0.7]{%
35 $\mathcolor{\GTS@secondColor}{\circ}$%
36 }}}%
37 \hspace{-0.39ex}%
38 \raisebox{1.05ex}{\scalebox{0.1}[0.1]{%
39 $\mathcolor{\GTS@secondColor}{\bullet}$%
40 }}}%
41 \hspace{-0.12ex}%
42 \raisebox{0.11ex}{\scalebox{0.1}[0.73]{%
43 $\mathcolor{\GTS@mainColor}{\smallblacksquare}$%
44 }}}%
45 \hspace{-0.40ex}%
46 \raisebox{-0.3ex}{\scalebox{0.7}[0.7]{%
47 $\mathcolor{\GTS@secondColor}{\circ}$%
48 }}}%
49 \hspace{-0.39ex}%
50 \raisebox{0.05ex}{\scalebox{0.1}[0.1]{%
51 $\mathcolor{\GTS@secondColor}{\bullet}$%
52 }}}%
53 \hspace{0.27ex}%
54 \if\GTS@drawUpArrow\empty\else%
55 \hspace{-0.65ex}%
56 \raisebox{-0.18ex}{\scalebox{0.5}[0.5]{%
57 \textcolor{\GTS@mainColor}{\textasciicircum}%
58 }}}%
59 \fi%
60 \if\GTS@drawDownArrow\empty\else%
61 \hspace{-0.65ex}%
62 \raisebox{1.37ex}{\scalebox{0.5}[-0.5]{%
63 \textcolor{\GTS@mainColor}{\textasciicircum}%
64 }}}%
65 \fi%
66 \if\GTS@drawSlash\empty\else%
67 \hspace{-0.65ex}%
68 \raisebox{0.25ex}{\scalebox{0.6}[0.6]{%
69 \textcolor{black}{/}%
70 }}}%
71 \fi%
72 %
73 }}
```

```

74 }}%
75 }
76
77 \GTS@newcommand{\GTSa}{\GTSadjacency/}

\GTSadjacencyRelation This macro will draw an adjacency symbol with relation spacing in math mode.
\GTSaR 78 \GTS@newcommand{\GTSadjacencyRelation}{\mathrel{\GTSadjacency/}}
79 \GTS@newcommand{\GTSaR}{\GTSadjacencyRelation/}

\GTSunadjacency This macro will draw an unadjacency symbol.
\GTSu 80 \GTS@newcommand{\GTSunadjacency}{%
81 \def\GTS@drawSlash{1}%
82 \GTSadjacency/%
83 \def\GTS@drawSlash{}}%
84 }
85
86 \GTS@newcommand{\GTSu}{\GTSunadjacency/}

\GTSunadjacencyRelation This macro will draw an unadjacency symbol with relation spacing in math mode.
\GTSuR 87 \GTS@newcommand{\GTSunadjacencyRelation}{\mathrel{\GTSunadjacency/}}
88 \GTS@newcommand{\GTSuR}{\GTSunadjacencyRelation/}

\GTSdirectedAdjacencyUp This macro will draw a directed adjacency upward symbol. The operand on the left of the
\GTSdAU symbol should be considered the source of the arc; the operand on the right of the symbol
should be considered the target of the arc.
89 \GTS@newcommand{\GTSdirectedAdjacencyUp}{%
90 \def\GTS@drawUpArrow{1}%
91 \GTSadjacency/%
92 \def\GTS@drawUpArrow{}}%
93 }
94
95 \GTS@newcommand{\GTSdAU}{\GTSdirectedAdjacencyUp/}

\GTSdirectedAdjacencyUp- This macro will draw a directed adjacency upward symbol with relation spacing in math
Relation mode.
\GTSdAUR 96 \GTS@newcommand{\GTSdirectedAdjacencyUpRelation}{%
97 \mathrel{\GTSdirectedAdjacencyUp/}%
98 }
99 \GTS@newcommand{\GTSdAUR}{\GTSdirectedAdjacencyUpRelation/}

\GTSnegatedDirected- This macro will draw a negated directed adjacency upward symbol.
AdjacencyUp 100 \GTS@newcommand{\GTSnegatedDirectedAdjacencyUp}{%
\GTSnDAU 101 \def\GTS@drawSlash{1}%
102 \GTSdirectedAdjacencyUp/%
103 \def\GTS@drawSlash{}}%
104 }
105
106 \GTS@newcommand{\GTSnDAU}{\GTSnegatedDirectedAdjacencyUp/}

\GTSnegatedDirected- This macro will draw a negated directed adjacency upward symbol with relation spacing in
AdjacencyUpRelation math mode.
\GTSnDAUR 107 \GTS@newcommand{\GTSnegatedDirectedAdjacencyUpRelation}{%
108 \mathrel{\GTSnegatedDirectedAdjacencyUp/}%
109 }
110 \GTS@newcommand{\GTSnDAUR}{\GTSnegatedDirectedAdjacencyDownRelation/}

\GTSdirectedAdjacencyDown This macro will draw a directed adjacency downward symbol. The operand on the left of the
\GTSdAD symbol should be considered the target of the arc; the operand on the right of the symbol
should be considered the source of the arc.
111 \GTS@newcommand{\GTSdirectedAdjacencyDown}{%
112 \def\GTS@drawDownArrow{1}%
113 \GTSadjacency/%
114 \def\GTS@drawDownArrow{}}%
115 }
116
117 \GTS@newcommand{\GTSdAD}{\GTSdirectedAdjacencyDown/}

```

`\GTSdirectedAdjacencyDown-` This macro will draw a directed adjacency downward symbol with relation spacing in math mode.

```

\GTSdADR 118 \GTS@newcommand{\GTSdirectedAdjacencyDownRelation}{%
119 \mathrel{\GTSdirectedAdjacencyDown/}%
120 }
121 \GTS@newcommand{\GTSdADR}{\GTSdirectedAdjacencyDownRelation/}

```

`\GTSnegatedDirected-` This macro will draw a negated directed adjacency downward symbol.

```

AdjacencyDown 122 \GTS@newcommand{\GTSnegatedDirectedAdjacencyDown}{%
\GTSnDADR 123 \def\GTS@drawSlash{1}%
124 \GTSdirectedAdjacencyDown/%
125 \def\GTS@drawSlash{}%
126 }
127
128 \GTS@newcommand{\GTSnDADR}{\GTSnegatedDirectedAdjacencyDown/}

```

`\GTSnegatedDirected-` This macro will draw a negated directed adjacency downward symbol with relation spacing in math mode.

```

AdjacencyDownRelation 129 \GTS@newcommand{\GTSnegatedDirectedAdjacencyDownRelation}{%
130 \mathrel{\GTSnegatedDirectedAdjacencyDown/}%
131 }
132 \GTS@newcommand{\GTSnDADR}{\GTSnegatedDirectedAdjacencyDownRelation/}

```

`\GTSincidence` This macro will draw an incidence symbol. The operand on the left of the symbol should be considered the vertex to which the edge/the operand on the right of the symbol is incident.

```

\GTSi 133 \GTS@newcommand{\GTSincidence}{%
134 \text{\ensuremath{%
135 \raisebox{0ex}{\scalebox{1.8}[1.8]{%
136 %
137 \raisebox{-0.3ex}{\scalebox{0.7}[0.7]{%
138 $\mathcolor{\GTS@secondColor}{\circ}$%
139 }}%
140 \hspace{-0.39ex}%
141 \raisebox{0.05ex}{\scalebox{0.1}[0.1]{%
142 $\mathcolor{\GTS@secondColor}{\bullet}$%
143 }}%
144 \hspace{-0.12ex}%
145 \raisebox{0.11ex}{\scalebox{0.1}[0.73]{%
146 $\mathcolor{\GTS@secondColor}{\smallblacksquare}$%
147 }}%
148 \hspace{-0.18ex}%
149 \raisebox{0.15ex}{\scalebox{0.2}[0.2]{%
150 $\mathcolor{\GTS@mainColor}{\smallblacksquare}$%
151 }}%
152 \hspace{0.2ex}%
153 \if\GTS@drawUpArrow\empty\else%
154 \hspace{-0.65ex}%
155 \raisebox{-0.18ex}{\scalebox{0.5}[0.5]{%
156 \textcolor{\GTS@secondColor}{\textasciicircum}%
157 }}%
158 \fi%
159 \if\GTS@drawDownArrow\empty\else%
160 \hspace{-0.65ex}%
161 \raisebox{1.37ex}{\scalebox{0.5}[-0.5]{%
162 \textcolor{\GTS@secondColor}{\textasciicircum}%
163 }}%
164 \fi%
165 \if\GTS@drawSlash\empty\else%
166 \hspace{-0.65ex}%
167 \raisebox{0.1ex}{\scalebox{0.5}[0.5]{%
168 \textcolor{black}{/}%
169 }}%
170 \fi%
171 %
172 }}%

```

```

173 }}%
174 }
175
176 \GTS@newcommand{\GTSi}{\GTSincidence/}

\GTSincidenceRelation This macro will draw an incidence symbol with relation spacing in math mode.
\GTSiR 177 \GTS@newcommand{\GTSincidenceRelation}{\mathrel{\GTSincidence/}}
178 \GTS@newcommand{\GTSiR}{\GTSincidenceRelation/}

\GTSnegatedIncidence This macro will draw a negated incidence symbol.
\GTSnI 179 \GTS@newcommand{\GTSnegatedIncidence}{%
180 \def\GTS@drawSlash{1}%
181 \GTSincidence/%
182 \def\GTS@drawSlash{}%
183 }
184
185 \GTS@newcommand{\GTSnI}{\GTSnegatedIncidence/}

\GTSnegatedIncidence- This macro will draw a negated incidence symbol with relation spacing in math mode.
Relation 186 \GTS@newcommand{\GTSnegatedIncidenceRelation}{%
\GTSnIR 187 \mathrel{\GTSnegatedIncidence/}%
188 }
189 \GTS@newcommand{\GTSnIR}{\GTSnegatedIncidenceRelation/}

\GTSoutIncidence This macro will draw a directed incidence upward (out(ward) incidence) symbol. The
\GTSoI operand on the left of the symbol should be considered the vertex to which the arc/the
operand on the right of the symbol is incident.
190 \GTS@newcommand{\GTSoutIncidence}{%
191 \def\GTS@drawUpArrow{1}%
192 \GTSincidence/%
193 \def\GTS@drawUpArrow{}%
194 }
195
196 \GTS@newcommand{\GTSoI}{\GTSoutIncidence/}

\GTSoutIncidenceRelation This macro will draw a directed incidence upward (out(ward) incidence) symbol with relation
\GTSoIR spacing in math mode.
197 \GTS@newcommand{\GTSoutIncidenceRelation}{%
198 \mathrel{\GTSoutIncidence/}%
199 }
200 \GTS@newcommand{\GTSoIR}{\GTSoutIncidenceRelation/}

\GTSnegatedOutIncidence This macro will draw a negated directed incidence upward (out(ward) incidence) symbol.
\GTSnOI 201 \GTS@newcommand{\GTSnegatedOutIncidence}{%
202 \def\GTS@drawSlash{1}%
203 \GTSoutIncidence/%
204 \def\GTS@drawSlash{}%
205 }
206
207 \GTS@newcommand{\GTSnOI}{\GTSnegatedOutIncidence/}

\GTSnegatedOutIncidence- This macro will draw a negated directed incidence upward (out(ward) incidence) symbol
Relation with relation spacing in math mode.
\GTSnOIR 208 \GTS@newcommand{\GTSnegatedOutIncidenceRelation}{%
209 \mathrel{\GTSnegatedOutIncidence/}%
210 }
211 \GTS@newcommand{\GTSnOIR}{\GTSnegatedOutIncidenceRelation/}

\GTSinIncidence This macro will draw a directed incidence downward (in(ward) incidence) symbol. The
\GTSiI operand on the left of the symbol should be considered the vertex to which the arc/the
operand on the right of the symbol is incident.
212 \GTS@newcommand{\GTSinIncidence}{%
213 \def\GTS@drawDownArrow{1}%
214 \GTSincidence/%
215 \def\GTS@drawDownArrow{}%

```

```

216 }
217
218 \GTS@newcommand{\GTSiI}{\GTSinIncidence/}

```

\GTSinIncidenceRelation This macro will draw a directed incidence downward (in(ward) incidence) symbol with relation spacing in math mode.

```

219 \GTS@newcommand{\GTSinIncidenceRelation}{%
220 \mathrel{\GTSinIncidence/}%
221 }
222 \GTS@newcommand{\GTSiIR}{\GTSinIncidenceRelation/}

```

\GTSnegatedInIncidence This macro will draw a negated directed incidence downward (in(ward) incidence) symbol.

```

\GTSnII 223 \GTS@newcommand{\GTSnegatedInIncidence}{%
224 \def\GTS@drawSlash{1}%
225 \GTSinIncidence/%
226 \def\GTS@drawSlash{}%
227 }
228
229 \GTS@newcommand{\GTSnII}{\GTSnegatedInIncidence/}

```

\GTSnegatedInIncidence-Relation This macro will draw a negated directed incidence downward (in(ward) incidence) symbol with relation spacing in math mode.

```

\GTSnIIR 230 \GTS@newcommand{\GTSnegatedInIncidenceRelation}{%
231 \mathrel{\GTSnegatedInIncidence/}%
232 }
233 \GTS@newcommand{\GTSnIIR}{\GTSnegatedInIncidenceRelation/}

```

\GTSadjacencyMonochrome This macro will draw a monochrome adjacency symbol.

```

\GTSaM 234 \GTS@newcommand{\GTSadjacencyMonochrome}{%
235 \GTSsetMainColor{black}%
236 \GTSsetSecondColor{black}%
237 \GTSadjacency/%
238 \GTSsetMainColor{\GTS@mainColorBackup}%
239 \GTSsetSecondColor{\GTS@secondColorBackup}%
240 }
241
242 \GTS@newcommand{\GTSaM}{\GTSadjacencyMonochrome/}

```

\GTSadjacencyMonochrome-Relation This macro will draw a monochrome adjacency symbol with relation spacing in math mode.

```

\GTSaMR 243 \GTS@newcommand{\GTSadjacencyMonochromeRelation}{%
244 \mathrel{\GTSadjacencyMonochrome/}%
245 }
246 \GTS@newcommand{\GTSaMR}{\GTSadjacencyMonochromeRelation/}

```

\GTSunadjacencyMonochrome This macro will draw a monochrome unadjacency symbol.

```

\GTSuM 247 \GTS@newcommand{\GTSunadjacencyMonochrome}{%
248 \def\GTS@drawSlash{1}%
249 \GTSadjacencyMonochrome/%
250 \def\GTS@drawSlash{}%
251 }
252
253 \GTS@newcommand{\GTSuM}{\GTSunadjacencyMonochrome/}

```

\GTSunadjacencyMonochrome-Relation This macro will draw a monochrome unadjacency symbol with relation spacing in math mode.

```

\GTSuMR 254 \GTS@newcommand{\GTSunadjacencyMonochromeRelation}{%
255 \mathrel{\GTSunadjacencyMonochrome/}%
256 }
257 \GTS@newcommand{\GTSuMR}{\GTSunadjacencyMonochromeRelation/}

```

\GTSdirectedAdjacencyUp-Monochrome This macro will draw a monochrome directed adjacency upward symbol. The operand on the left of the symbol should be considered the source of the arc; the operand on the right of the symbol should be considered the target of the arc.

```

258 \GTS@newcommand{\GTSdirectedAdjacencyUpMonochrome}{%
259 \def\GTS@drawUpArrow{1}%

```

```

260 \GTSadjacencyMonochrome/%
261 \def\GTS@drawUpArrow{}%
262 }
263
264 \GTS@newcommand{\GTSdAUM}{\GTSdirectedAdjacencyUpMonochrome/}

```

`\GTSdirectedAdjacencyUpMonochromeRelation` This macro will draw a monochrome directed adjacency upward symbol with relation spacing in math mode.

```

\GTSdAUMR 265 \GTS@newcommand{\GTSdirectedAdjacencyUpMonochromeRelation}{%
266 \mathrel{\GTSdirectedAdjacencyUpMonochrome/}%
267 }
268 \GTS@newcommand{\GTSdAUMR}{\GTSdirectedAdjacencyUpMonochromeRelation/}

```

`\GTSnegatedDirectedAdjacencyUpMonochrome` This macro will draw a monochrome negated directed adjacency upward symbol.

```

269 \GTS@newcommand{\GTSnegatedDirectedAdjacencyUpMonochrome}{%
\GTSnDAUM 270 \def\GTS@drawSlash{1}%
271 \GTSdirectedAdjacencyUpMonochrome/%
272 \def\GTS@drawSlash{}%
273 }
274
275 \GTS@newcommand{\GTSnDAUM}{\GTSnegatedDirectedAdjacencyUpMonochrome/}

```

`\GTSnegatedDirectedAdjacencyUpMonochromeRelation` This macro will draw a monochrome negated directed adjacency upward symbol with relation spacing in math mode.

```

Relation 276 \GTS@newcommand{\GTSnegatedDirectedAdjacencyUpMonochromeRelation}{%
\GTSnDAUMR 277 \mathrel{\GTSnegatedDirectedAdjacencyUpMonochrome/}%
278 }
279 \GTS@newcommand{\GTSnDAUMR}{%
280 \GTSnegatedDirectedAdjacencyDownMonochromeRelation/%
281 }

```

`\GTSdirectedAdjacencyDownMonochrome` This macro will draw a monochrome directed adjacency downward symbol. The operand on the left of the symbol should be considered the target of the arc; the operand on the right of the symbol should be considered the source of the arc.

```

282 \GTS@newcommand{\GTSdirectedAdjacencyDownMonochrome}{%
283 \def\GTS@drawDownArrow{1}%
284 \GTSadjacencyMonochrome/%
285 \def\GTS@drawDownArrow{}%
286 }
287
288 \GTS@newcommand{\GTSdADM}{\GTSdirectedAdjacencyDownMonochrome/}

```

`\GTSdirectedAdjacencyDownMonochromeRelation` This macro will draw a monochrome directed adjacency downward symbol with relation spacing in math mode.

```

\GTSdADMR 289 \GTS@newcommand{\GTSdirectedAdjacencyDownMonochromeRelation}{%
290 \mathrel{\GTSdirectedAdjacencyDownMonochrome/}%
291 }
292 \GTS@newcommand{\GTSdADMR}{\GTSdirectedAdjacencyDownMonochromeRelation/}

```

`\GTSnegatedDirectedAdjacencyDownMonochrome` This macro will draw a monochrome negated directed adjacency downward symbol.

```

293 \GTS@newcommand{\GTSnegatedDirectedAdjacencyDownMonochrome}{%
\GTSnDADM 294 \def\GTS@drawSlash{1}%
295 \GTSdirectedAdjacencyDownMonochrome/%
296 \def\GTS@drawSlash{}%
297 }
298
299 \GTS@newcommand{\GTSnDADM}{\GTSnegatedDirectedAdjacencyDownMonochrome/}

```

`\GTSnegatedDirectedAdjacencyDownMonochromeRelation` This macro will draw a monochrome negated directed adjacency downward symbol with relation spacing in math mode.

```

Relation 300 \GTS@newcommand{\GTSnegatedDirectedAdjacencyDownMonochromeRelation}{%
\GTSnDADMR 301 \mathrel{\GTSnegatedDirectedAdjacencyDownMonochrome/}%
302 }
303 \GTS@newcommand{\GTSnDADMR}{%
304 \GTSnegatedDirectedAdjacencyDownMonochromeRelation/%
305 }

```

`\GTSincidenceMonochrome` This macro will draw a monochrome incidence symbol. The operand on the left of the symbol should be considered the vertex to which the edge/the operand on the right of the symbol is incident.

```

306 \GTS@newcommand{\GTSincidenceMonochrome}{%
307 \GTSsetMainColor{black}%
308 \GTSsetSecondColor{black}%
309 \GTSincidence/%
310 \GTSsetMainColor{\GTS@mainColorBackup}%
311 \GTSsetSecondColor{\GTS@secondColorBackup}%
312 }
313
314 \GTS@newcommand{\GTSiM}{\GTSincidenceMonochrome/}
```

`\GTSincidenceMonochrome-` This macro will draw a monochrome incidence symbol with relation spacing in math mode.

```

Relation 315 \GTS@newcommand{\GTSincidenceMonochromeRelation}{%
\GTSiMR 316 \mathrel{\GTSincidenceMonochrome/}%
317 }
318 \GTS@newcommand{\GTSiMR}{\GTSincidenceMonochromeRelation/}
```

`\GTSnegatedIncidence-` This macro will draw a monochrome negated incidence symbol.

```

Monochrome 319 \GTS@newcommand{\GTSnegatedIncidenceMonochrome}{%
\GTSnIM 320 \def\GTS@drawSlash{1}%
321 \GTSincidenceMonochrome/%
322 \def\GTS@drawSlash{}%
323 }
324
325 \GTS@newcommand{\GTSnIM}{\GTSnegatedIncidenceMonochrome/}
```

`\GTSnegatedIncidence-` This macro will draw a monochrome negated incidence symbol with relation spacing in math mode.

```

MonochromeRelation 326 \GTS@newcommand{\GTSnegatedIncidenceMonochromeRelation}{%
\GTSnIMR 327 \mathrel{\GTSnegatedIncidenceMonochrome/}%
328 }
329 \GTS@newcommand{\GTSnIMR}{\GTSnegatedIncidenceMonochromeRelation/}
```

`\GTSoutIncidenceMonochrome` This macro will draw a monochrome directed incidence upward (out(ward) incidence) symbol. The operand on the left of the symbol should be considered the vertex to which the arc/the operand on the right of the symbol is incident.

```

\GTSoIM 330 \GTS@newcommand{\GTSoutIncidenceMonochrome}{%
331 \def\GTS@drawUpArrow{1}%
332 \GTSincidenceMonochrome/%
333 \def\GTS@drawUpArrow{}%
334 }
335
336 \GTS@newcommand{\GTSoIM}{\GTSoutIncidenceMonochrome/}
```

`\GTSoutIncidenceMonochrome-` This macro will draw a monochrome directed incidence upward (out(ward) incidence) symbol with relation spacing in math mode.

```

Relation 337 \GTS@newcommand{\GTSoutIncidenceMonochromeRelation}{%
\GTSoIMR 338 \mathrel{\GTSoutIncidenceMonochrome/}%
339 }
340 \GTS@newcommand{\GTSoIMR}{\GTSoutIncidenceMonochromeRelation/}
```

`\GTSnegatedOutIncidence-` This macro will draw a monochrome negated directed incidence upward (out(ward) incidence) symbol.

```

Monochrome 341 \GTS@newcommand{\GTSnegatedOutIncidenceMonochrome}{%
\GTSnOIM 342 \def\GTS@drawSlash{1}%
343 \GTSoutIncidenceMonochrome/%
344 \def\GTS@drawSlash{}%
345 }
346
347 \GTS@newcommand{\GTSnOIM}{\GTSnegatedOutIncidenceMonochrome/}
```

`\GTSnegatedOutIncidence-` This macro will draw a monochrome negated directed incidence upward (out(ward) inci-
`MonochromeRelation` dence) symbol with relation spacing in math mode.

```

\GTSnOIMR 348 \GTS@newcommand{\GTSnegatedOutIncidenceMonochromeRelation}{%
349 \mathrel{\GTSnegatedOutIncidenceMonochrome/}%
350 }
351 \GTS@newcommand{\GTSnOIMR}{\GTSnegatedOutIncidenceMonochromeRelation/}

```

`\GTSinIncidenceMonochrome` This macro will draw a monochrome directed incidence downward (in(ward) incidence) sym-
`\GTSiIM` bol. The operand on the left of the symbol should be considered the vertex to which the
arc/the operand on the right of the symbol is incident.

```

352 \GTS@newcommand{\GTSinIncidenceMonochrome}{%
353 \def\GTS@drawDownArrow{1}%
354 \GTSinIncidenceMonochrome/%
355 \def\GTS@drawDownArrow{}%
356 }
357
358 \GTS@newcommand{\GTSiIM}{\GTSinIncidenceMonochrome/}

```

`\GTSinIncidenceMonochrome-` This macro will draw a monochrome directed incidence downward (in(ward) incidence) sym-
`Relation` bol with relation spacing in math mode.

```

\GTSiIMR 359 \GTS@newcommand{\GTSinIncidenceMonochromeRelation}{%
360 \mathrel{\GTSinIncidenceMonochrome/}%
361 }
362 \GTS@newcommand{\GTSiIMR}{\GTSinIncidenceMonochromeRelation/}

```

`\GTSnegatedInIncidence-` This macro will draw a monochrome negated directed incidence downward (in(ward) inci-
`Monochrome` dence) symbol.

```

\GTSnIIM 363 \GTS@newcommand{\GTSnegatedInIncidenceMonochrome}{%
364 \def\GTS@drawSlash{1}%
365 \GTSinIncidenceMonochrome/%
366 \def\GTS@drawSlash{}%
367 }
368
369 \GTS@newcommand{\GTSnIIM}{\GTSnegatedInIncidenceMonochrome/}

```

`\GTSnegatedInIncidence-` This macro will draw a monochrome negated directed incidence downward (in(ward) inci-
`MonochromeRelation` dence) symbol with relation spacing in math mode.

```

\GTSnIIMR 370 \GTS@newcommand{\GTSnegatedInIncidenceMonochromeRelation}{%
371 \mathrel{\GTSnegatedInIncidenceMonochrome/}%
372 }
373 \GTS@newcommand{\GTSnIIMR}{\GTSnegatedInIncidenceMonochromeRelation/}
374 \endinput
375 \</package>

```

4 Acknowledgments

Thank You God! Thank You Father! Thank You Jesus! Thank You Holy-Spirit!

5 Change History

v0.1.0 – 2026-08-01		v1.1.0 – 2026-08-29	
General: Initial version	1	General: Added a memo	1
v1.0.0 – 2026-08-26		v1.1.1 – 2026-08-30	
General: First public release	1	General: Small corrections and improvements	1

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