

Asymptote Reference Card

Program structure/functions

| | |
|--|---------------------------------|
| <code>import "filename"</code> | import module |
| <code>import "filename" as name</code> | import filename as module name |
| <code>include "filename"</code> | include verbatim text from file |
| <code>type f(type,...);</code> | optional function declaration |
| <code>type name;</code> | variable declaration |
| <code>type f(type arg,...) {</code> <code>statements</code> <code>return value;</code> <code>}</code> | function definition |

Data types/declarations

| | |
|--|--------------------------------|
| boolean (true or false) | <code>bool</code> |
| tri-state boolean (true, default, or false) | <code>bool3</code> |
| integer | <code>int</code> |
| float (double precision) | <code>real</code> |
| ordered pair (complex number) | <code>pair</code> |
| character string | <code>string</code> |
| fixed piecewise cubic Bezier spline | <code>path</code> |
| unresolved piecewise cubic Bezier spline | <code>guide</code> |
| color, line type/width/cap, font, fill rule | <code>pen</code> |
| label with position, alignment, pen attributes | <code>Label</code> |
| drawing canvas | <code>picture</code> |
| affine transform | <code>transform</code> |
| constant (unchanging) value | <code>const</code> |
| allocate in higher scope | <code>static</code> |
| no value | <code>void</code> |
| inhibit implicit argument casting | <code>explicit</code> |
| structure | <code>struct</code> |
| create name by data type | <code>typedef type name</code> |

3D data types (import three;)

| | |
|---------------------|-------------------------|
| ordered triple | <code>triple</code> |
| 3D path | <code>path3</code> |
| 3D guide | <code>guide3</code> |
| 3D affine transform | <code>transform3</code> |

Constants

| | |
|--|-------------------------------|
| exponential form | <code>6.02e23</code> |
| TeX string constant | <code>"abc...de"</code> |
| TeX strings: special characters | <code>\\, \"</code> |
| C strings: constant | <code>'abc...de'</code> |
| C strings: special characters | <code>\\, \" \' \?</code> |
| C strings: newline, cr, tab, backspace | <code>\n \r \t \b</code> |
| C strings: octal, hexadecimal bytes | <code>\0-\377 \x0-\xFF</code> |

Operators

arithmetic operations
modulus (remainder)
comparisons
not
and or (conditional evaluation of RHS)
and or xor
cast expression to type
increment decrement prefix operators
assignment operators
conditional expression
structure member operator
expression evaluation separator

Flow control

statement terminator
block delimiters
comment delimiters
comment to end of line delimiter
exit from `while/do/for`
next iteration of `while/do/for`
return value from function
terminate execution
abort execution with error message

Flow constructions (if/while/for/do)

| |
|--|
| <code>if(expr) statement</code> <code>else if(expr) statement</code> <code>else statement</code> |
| <code>while(expr)</code> <code>statement</code> |
| <code>for(expr₁; expr₂; expr₃)</code> <code>statement</code> |
| <code>for(type var : array)</code> <code>statement</code> |
| <code>do statement</code> <code>while(expr);</code> |

`+ - * /`
`%`
`== != > >= < <=`
`!`
`&& ||`
`& | ^`
`(type) expr`
`++ --`
`+= -= *= /= %=`
`expr1 ? expr2 : expr3`
`name.member`
`,`

`;`
`{ }`
`/* */`
`//`
`break;`
`continue;`
`return expr;`
`exit();`
`abort(string);`

Arrays

array
 array element *i*
 array indexed by elements of int array *A*
 anonymous array
 array containing *n* deep copies of *x*
 length
 cyclic flag
 pop element *x*
 push element *x*
 append array *a*
 insert rest arguments at index *i*
 delete element at index *i*
 delete elements with indices in [*i*,*j*]
 delete all elements
 test whether element *n* is initialized
 array of indices of initialized elements
 complement of int array in {0,...,*n*-1}
 deep copy of array *a*
 array {0,1,...,*n*-1}
 array {*n*,*n*+1,...,*m*}
 array {*n*-1,*n*-2,...,0}
 array {*f*(0),*f*(1),...,*f*(*n*-1)}
 array obtained by applying *f* to array *a*
 uniform partition of [*a*,*b*] into *n* intervals
 concat specified 1D arrays
 return sorted array
 return array sorted using ordering *less*
 search sorted array *a* for key
 index of first true value of bool array *a*
 index of *n*th true value of bool array *a*

Initialization

initialize variable
 initialize array

path connectors

straight segment
 Beziér segment with implicit control points
 Beziér segment with explicit control points
 concatenate
 lift pen
 ..tension atleast 1..
 ..tension atleast infinity..

Labels

implicit cast of string *s* to Label
 Label *s* with relative position and alignment
 Label *s* with absolute position and alignment
 Label *s* with specified pen

draw commands

draw path with current pen
 draw path with pen
 draw labeled path
 draw arrow with pen
 draw path on picture
 draw visible portion of line through two pairs

```
type[] name;
name[i]
name[A]
new type[dim]
array(n,x)
name.length
name.cyclic
name.pop()
name.push(x)
name.append(a)
name.insert(i,...)
name.delete(i)
name.delete(i,j)
name.delete()
name.initialized(n)
name.keys
complement(a,n)
copy(a)
sequence(n)
sequence(n,m)
reverse(n)
sequence(f,n)
map(f,a)
uniform(a,b,n)
concat(a,b,...)
sort(a)
sort(a,less)
search(a,key)
find(a)
find(a,n)
```

```
type name=value;
type[] name={...};
```

```
--
..
..controls c0 and c1.
&
^^
::
---
```

```
draw(path)
draw(path,pen)
draw(Label,path)
draw(path,pen,Arrow)
draw(picture,path)
drawline(pair,pair)
```

fill commands

fill path with current pen
 fill path with pen
 fill path on picture

label commands

label a pair with optional alignment *z*
 label a path with optional alignment *z*
 add label to picture

clip commands

clip to path
 clip to path with fill rule
 clip picture to path

pens

Grayscale pen from value in [0,1]
 RGB pen from values in [0,1]
 CMYK pen from values in [0,1]
 RGB pen from heximdecimal string]
 heximdecimal string from rgb pen]
 hsv pen from values in [0,1]
 invisible pen
 default pen
 current pen
 solid pen
 dotted pen
 wide dotted current pen
 wide dotted pen
 dashed pen
 long dashed pen
 dash dotted pen
 long dash dotted pen
 PostScript butt line cap
 PostScript round line cap
 PostScript projecting square line cap
 miter join
 round join
 bevel join
 pen with miter limit
 zero-winding fill rule
 even-odd fill rule
 align to character bounding box (default)
 align to T_EX baseline
 pen with font size (pt)
 LaTeX pen from encoding,family,series,shape
 T_EX pen
 scaled T_EX pen
 PostScript font from strings
 pen with opacity in [0,1]
 construct pen nib from polygonal path
 pen mixing operator

```
fill(path)
fill(path,pen)
fill(picture,path)
```

```
label(Label,pair,z)
label(Label,path,z)
label(picture,Label)
```

```
clip(path)
clip(path,pen)
clip(picture,path)
```

```
gray(g)
rgb(r,g,b)
cmyk(r,g,b)
rgb(string)
hex(pen)
hsv(h,s,v)
invisible
defaultpen
currentpen
solid
dotted
Dotted
Dotted(pen)
dashed
longdashed
dashdotted
longdashdotted
squarecap
roundcap
extendcap
miterjoin
roundjoin
beveljoin
miterlimit(real)
zerowinding
evenodd
nobasealign
basealign
fontsize(real)
font(strings)
font(string)
font(string,real)
Courier(series,shape)
opacity(real)
makepen(path)
+
```

path operations

number of segments in path **p**
number of nodes in path **p**
is path **p** cyclic?
is segment **i** of path **p** straight?
is path **p** straight?
coordinates of path **p** at time **t**
direction of path **p** at time **t**
direction of path **p** at **length(p)**
unit(**dir(p)+dir(q)**)
acceleration of path **p** at time **t**
radius of curvature of path **p** at time **t**
precontrol point of path **p** at time **t**
postcontrol point of path **p** at time **t**
arclength of path **p**
time at which **arclength(p)=L**
point on path **p** at arclength **L**
first value **t** at which **dir(p,t)=z**
time **t** at relative fraction **l** of **arclength(p)**
point at relative fraction **l** of **arclength(p)**
point midway along arclength of **p**
path running backwards along **p**
subpath of **p** between times **a** and **b**
times for one intersection of paths **p** and **q**
times at which **p** reaches minimal extents
times at which **p** reaches maximal extents
intersection times of paths **p** and **q**
intersection times of path **p** with ‘--a--b--’
intersection times of path **p** crossing $x = x$
intersection times of path **p** crossing $y = z.y$
intersection point of paths **p** and **q**
intersection points of **p** and **q**
intersection of extension of **P--Q** and **p--q**
lower left point of bounding box of path **p**
upper right point of bounding box of path **p**
subpaths of **p** split by **nth** cut of **knife**
winding number of path **p** about pair **z**
pair **z** lies within path **p**?
pair **z** lies within or on path **p**?
path surrounding region bounded by paths
path filled by **draw(g,p)**
unit square with lower-left vertex at origin
unit circle centered at origin
circle of radius **r** about **c**
arc of radius **r** about **c** from angle **a** to **b**
unit **n**-sided polygon
unit **n**-point cyclic cross

pictures

add picture **pic** to **currentpicture**
add picture **pic** about pair **z**

length(p)
size(p)
cyclic(p)
straight(p,i)
piecewisestraight(p)
point(p,t)
dir(p,t)
dir(p)
dir(p,q)
accel(p,t)
radius(p,t)
precontrol(p,t)
postcontrol(p,t)
arclength(p)
arctime(p,L)
arcpoint(p,L)
dirtime(p,z)
reltime(p,l)
relpoint(p,l)
midpoint(p)
reverse(p)
subpath(p,a,b)
intersect(p,q)
mintimes(p)
maxtimes(p)
intersections(p,q)
intersections(p,a,b)
times(p,x)
times(p,z)
intersectionpoint(p,q)
intersectionpoints(p,q)
extension(P,Q,p,q)
min(p)
max(p)
cut(p,knife,n)
windingnumber(p,z)
interior(p,z)
inside(p,z)
buildcycle(...)
strokepath(g,p)
unitsquare
unitcircle
circle(c,r)
arc(c,r,a,b)
polygon(n)
cross(n)

add(pic)
add(pic,z)

affine transforms

identity transform
shift by values
shift by pair
scale by **x** in the x direction
scale by **y** in the y direction
scale by **x** in both directions
scale by real values **x** and **y**
map $(x,y) \rightarrow (x+sy,y)$
rotate by real **angle** in degrees about pair **z**
reflect about line from **P--Q**

string operations

concatenate operator
string length
position \geq **pos** of first occurrence of **t** in **s**
position \leq **pos** of last occurrence of **t** in **s**
string with **t** inserted in **s** at **pos**
string **s** with **n** characters at **pos** erased
substring of string **s** of length **n** at **pos**
string **s** reversed
string **s** with **before** changed to **after**
string **s** translated via $\{\{\text{before}, \text{after}\}, \dots\}$
format **x** using C-style format string **s**
casts hexadecimal string to an integer
casts **x** to string using precision **digits**
current time formatted by **format**
time in seconds of string **t** using **format**
string corresponding to **seconds** using **format**
split **s** into strings separated by **delimiter**

identity()
shift(real,real)
shift(pair)
xscale(x)
yscale(y)
scale(x)
scale(x,y)
slant(s)
rotate(angle,z=(0,0))
reflect(P,Q)

+
length(string)
find(s,t,pos=0)
rfind(s,t,pos=-1)
insert(s,pos,t)
erase(s,pos,n)
substr(s,pos,n)
reverse(s)
replace(s,before,after)
replace(s,string [][] table)
format(s,x)
hex(s)
string(x,digits=realDigits)
time(format="%a %b %d %T %Z %Y")
seconds(t,format)
time(seconds,format)
split(s,delimiter="")

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