

# 1 Usage

## 1.1 Input

Upon calling makepoints, print a number 0 or 1 to cin. 0 is for generating a slope field, 1 is for generating a curve.

To generate a slope field, enter the following arguments in this order:

```
rpn #a string containing a postfix mathematical expression, according to the definition 1
#the next four variables define the section of the Cartesian Plane with a slope field in
xmin
xmax
ymin
ymax
xs #the number of columns in the slope field
ys #the number of rows in the slope field
```

And to generate a curve:

```
rpn
xmin
xmax
ymin
ymax
initx #the x-coordinate of the initial condition
inity #the y-coordinate of the initial condition
samples #the number of line segments making up the curve
len #the length of the desired curve
```

## 1.2 Output

All input is printed to cout.

If a slope field was generated, then the output will be a list of numbers, corresponding to slopes. They are ordered as follows: First is the slope corresponding to the bottom-leftmost point in the slope field. From there they increase in  $y$  but not in  $x$ ,  $ys$  times. Then it returns to the bottom and increments  $x$  by 1, and so on, going up each column in turn. Each slope is separated by a new line.

If a curve was generated, then the output will be a list of pairs of numbers. Within pairs, numbers are separated by spaces, and pairs are separated by new lines. The first element of a pair corresponds to its relative  $x$ -position in the specified range; -1 is the furthest left  $x$  value, and 1 is the furthest right. Similarly, the second corresponds to its relative  $y$ -position, again from -1 to 1. The pairs are all sorted from smallest to greatest value of  $x$ . The curve is generated by “connecting the dots” in order of increasing  $x$ .

## 2 Postfix String

### 2.1 Functions

#### 2.1.1 Nice Functions

$$x\ y\ + = x + y \quad x\ y\ - = x - y \quad x\ y\ * = x \times y$$

$$x\ y\ /\ = \frac{x}{y} \quad x\ y\ \wedge = x^y$$

$$x\ y\ b = \log_y x \quad x\ l = \ln(x) \quad x\ a = |x|$$

#### 2.1.2 Trig Functions

$$x\ s = \sin(x) \quad x\ c = \cos(x) \quad x\ t = \tan(x)$$

$$x\ u = \arcsin(x) \quad x\ v = \arccos(x) \quad x\ w = \arctan(x)$$

$$x\ p = \sec(x) \quad x\ q = \csc(x) \quad x\ r = \cot(x)$$

$$x\ d = \operatorname{arcsec}(x) \quad x\ e = \operatorname{arccsc}(x) \quad x\ f = \operatorname{arccot}(x)$$

$$x\ h = \sinh(x) \quad x\ i = \cosh(x) \quad x\ j = \tanh(x)$$

$$x\ m = \operatorname{arcsech}(x) \quad x\ n = \operatorname{arccoth}(x) \quad x\ o = \operatorname{arccsch}(x)$$

$$x\ g = \operatorname{sech}(x) \quad x\ k = \operatorname{csch}(x) \quad x\ z = \operatorname{coth}(x)$$

$$x\ A = \operatorname{arcsec}(x) \quad x\ B = \operatorname{arccsc}(x) \quad x\ C = \operatorname{arccot}(x)$$

### 2.2 Requirements

- The RPN expression must have every argument separated by one space.
- The RPN expression must have a trailing space.