ITP20003 Java Programming

Lab 5. Work with Class

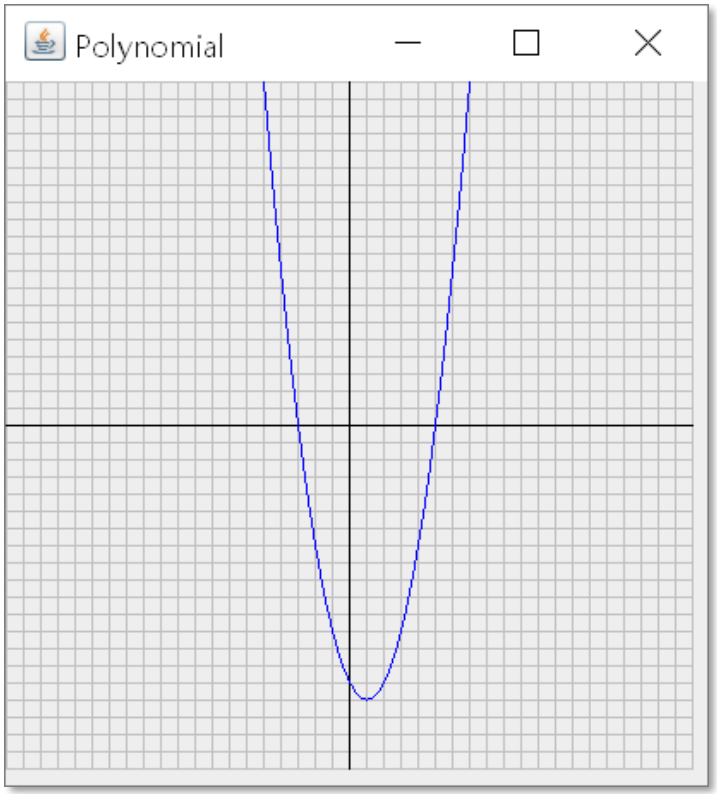
Lab 5

- Two more examples
  - Polynomial Plotter
  - Figures
- Missions 8 & 9
  - Team

Team1	김재윤	박혜빈
Team2	백주열	이한빈
Team3	Wongani	이혁재
Team4	김아론	김지민
Team5	김시온	전혜원
Team6	윤석규	이지행
Team7	박수현	심충일
Team8	이종원	양예진
Team9	황보효정	김예군
Team10	김소은	유채우

Polynomial Potter: Overview

- Receive a polynomial formula in a single variable, $f(x)$, and plot the graph of $y = f(x)$ on a GUI window
  - a polynomial formula is continuous at every x value
  - e.g., $y = x^2 - 2x - 15$



Polynomial Formula

- A polynomial formula in one variable is an expression consisting of numbers and the variable and their connections with arithmetic operators addition, subtraction, and multiplication
  - e.g., $2x + 1$, $(x + 2)(1 - x)$, $3x^2 + 2x - 1$

- An expression can be formally defined as a string derived from *E* with the following rules:

  $E \rightarrow T \mid x \mid (E + E) \mid (E * E) \mid (E - E)$

  $T \rightarrow 0 \mid 1 \mid 2 \mid \ldots \mid -1 \mid -2 \mid -3 \ldots$

Prefix Notation of Expression

- Accept an expression of the target polynomial function in a prefix notation
  - e.g., `(+ (* x x) (+ (* 2 x) 1))`,
    `(* (- x 3) (+ x 2))`
  - grammar

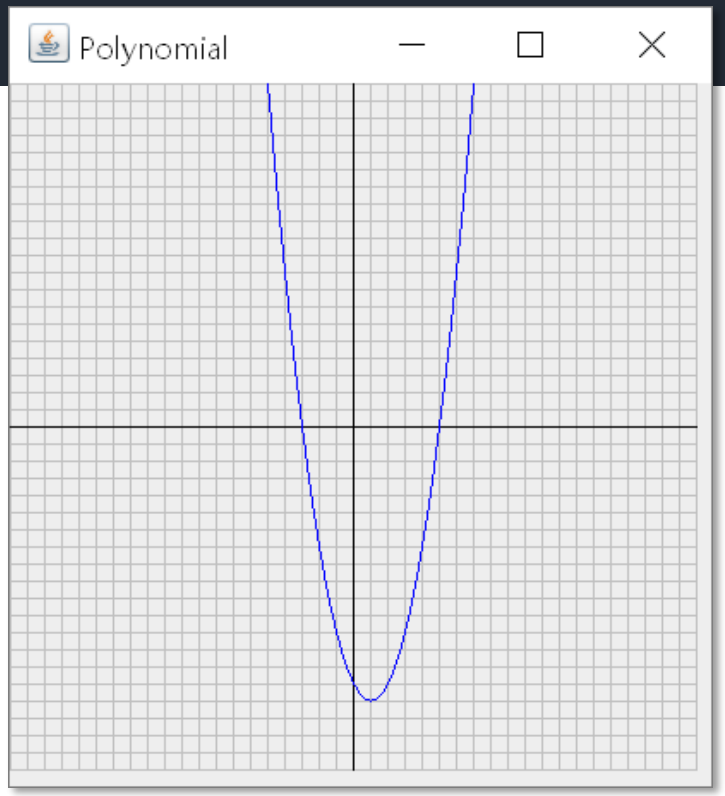
$$E \rightarrow T \mid \texttt{x} \mid \texttt{(+}\ E\ E\texttt{)} \mid \texttt{(*}\ E\ E\texttt{)} \mid \texttt{(-}\ E\ E\texttt{)}$$

$$T \rightarrow \mathbb{R}$$

  - c.f. prefix, infix, postfix notations

Example

```
$ java Polynomial "(* (- x 5) (+ x 3))"
$ java Polynomial "(- (- (* x x) (* 2 x)) 15)"
$
```



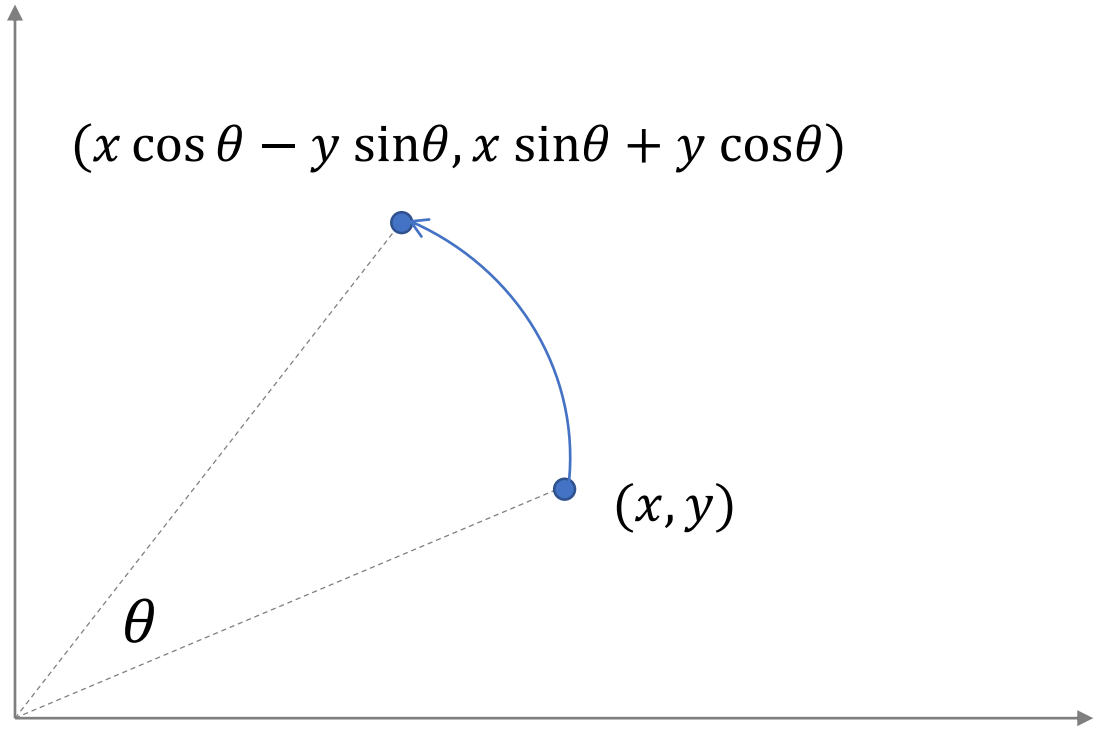
Figures

- Draw figures such as squares, triangles, circles and then command them to move and rotate
  - each figure has a shape, a position, a name, and it is plotted on a 400x400 plane
  - command
    - movx *p d* move figure *p* to right by *d*
    - movy *p d* move figure *p* to down by *d*
    - rotate *p r* rotate figure *p d* degree

Modeling

- Point
- Triangle
- Circle
- Square

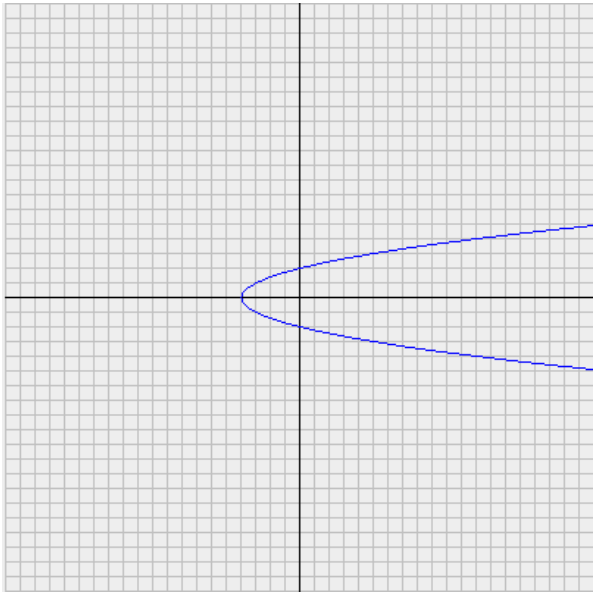
Rotating Figures



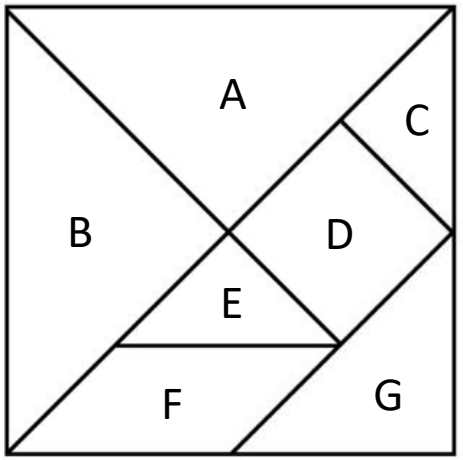
M8. Polynomial

- Using Polynomial.java, construct PolynomialYX with the following changes
  - a given polynomial function is an implicit function which defines x in terms of y, i.e., $x = f(y)$
  - a given expression is specified in a postfix notation
  - an expression has a new operator power ^
  - e.g.,

```
$ java PolynomialYX "((y 2 ^) 4 -)"
```



M9. Tangram (1/2)



- Extend Figures to a Tangram game
  - the program initially arranges all 7 pieces as given above
  - a user can move or rotate a piece by giving a command

- Steps
  - define a class to represent a tetragon
  - define 7 pieces and arrange them in correct positions
  - extend the commands to accept the actions for the 7 pieces
  - find a sequence of commands to form the pieces as shown in the next slide

M9. Tangram (2/2)