ITP20003 Java Programming

Lab 5. Work with Class

Lab 5

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

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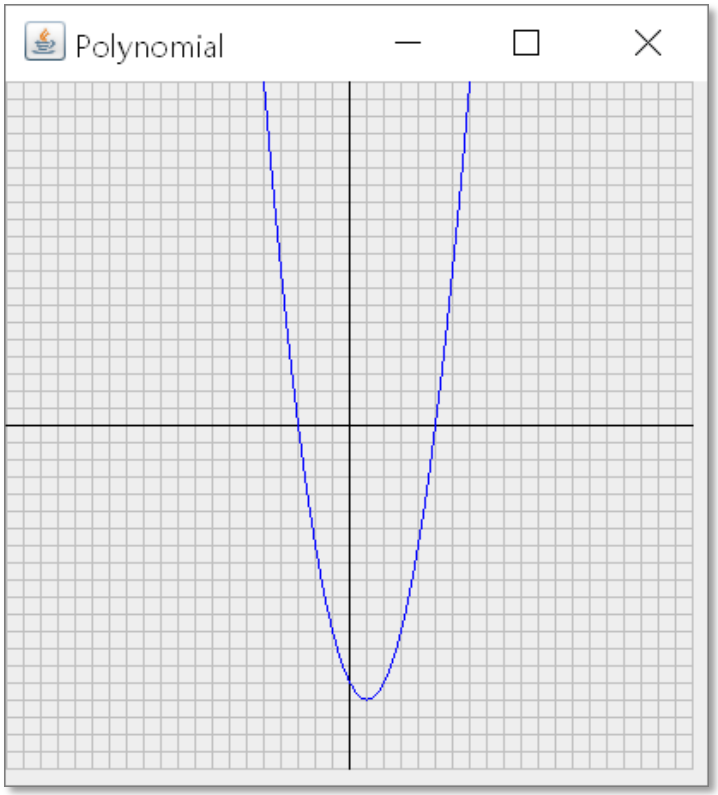
Team3	Wongani	이혁재
Team4	김아론	김지민
Team5	김시온	전혜원
Team6	윤석규	이지행
Team7	박수현	심충일
Team8	이종원	양예진
Team9	황보효정	김예군
Team10	김소은	유채우

Polynomial Plotter: 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

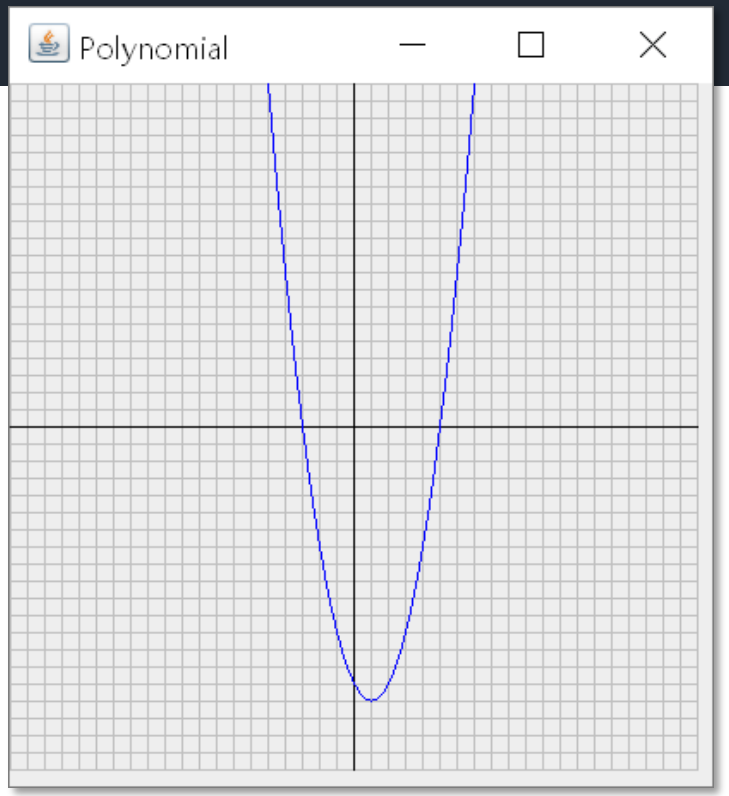
$$E \rightarrow T \mid \texttt{x} \mid \texttt{(+}\ E\ E\texttt{)} \mid \texttt{(*}\ E\ E\texttt{)} \mid \texttt{(-}\ E\ E\texttt{)}$$

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

  - c.f. prefix, infix, postfix notations

Example

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



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 -)"`