2.2: Evaluate Polynomial Functions (Day 1)

- Vocabulary for Polynomials
- Use direct substitution to evaluate the polynomial function
- Use synthetic division to evaluate the polynomial function

Monday's homework (Sept. 28)
Day 1 and Day 2 of Chapter 2 syllabus

Ch 1 Review WS answer correction:
15b) $25(x^2 + 3)(x^2 - 3)$

Monomial: a number, a variable, or a product of numbers and variables

$9 \quad x \quad 9x \quad x^2 \quad 11x^2y$

Polynomial: an expression involving one or more monomials

Characteristics:
1) whole exponents
2) real coefficients
3) no division by variables

Are these expressions polynomials?

a.) $2x^2+4x-3$ yes

b) 0 yes

c) $\frac{5}{x^2}$ no; x^{-2} has the exponent as a negative number

$5x^{-2}$

d.) $\frac{x^2}{5}$ yes

e.) $\sqrt{x} = x^{1/2}$ no

f.) $-3x^2+4x^5$ yes

Common Polynomial Functions

Degree	Type	Examples (in standard form)
0	Constant	$f(x) = 7$
1	Linear	$f(x) = 3x - 5$
+2	Quadratic	$f(x) = 2x^2 + 4x - 3$
3	Cubic	$f(x) = x^3 - 3x^2 + 4x - 8$
4	Quartic	$f(x) = x^4 + 3x^3 - 4x^2 - 3x + 1$

Classifying by degree of largest exponent

Classifying by number of terms

Monomial One term

Binomial Two terms

Trinomial Three terms

Polynomial When classifying, use this for four or more terms

Classify by the degree and the number of terms

a.) $4x - 27x^2 + \pi$
trinomial; quadratic

b.) $2x + 7$
binomial; linear

c.) 30^4
monomial; constant

d.) $(x+2)^2$
$x^2 + 4x + 4$
trinomial; quad.

e.) $5x^6 - 3x^2 + 4x - 1$
polynomial; degree 6

Standard form for a polynomial:

when the terms' exponents are in descending order

#1 $1 + 3x^4 - x + 2x^3$

$3x^4 + 2x^3 - x + 1$

st. form

Leading coefficient: the coefficient of the term with the largest exponent

#2 $1 + 2x - 7x^3 + 3x^2$

leading coeff : -7

Use direct substitution to evaluate the polynomial function for the given value of x.

#3 $f(x) = 3x - 2$; $f(4) =$ _____

$f(4) = 10$

Use direct substitution to evaluate the polynomial function for the given value of x.

#4 $t(x) = 5x^4 + 2x - 8 \; ; \; x = -2$

$$t(-2) = 5(-2)^4 + 2(-2) - 8$$

$$= 80 - 4 - 8$$

$$= 68$$

Use direct substitution to evaluate the polynomial function for the given value of x.

#5 $g(x) = x^4 - 2x^3 + 3x^2 - 7 \; ; \; x = -2$

$g(-2) = 16 + 16 + 12 - 7$

$= 37$

Use synthetic substitution to evaluate the polynomial function for the given value of x.

Make sure the polynomial is in standard form!
Consider if all terms are present

Use synthetic substitution to evaluate the polynomial function for the given value of x.

#6 $g(x) = x^4 - 2x^3 + 3x^2 - 7 \;;\; x = -2$

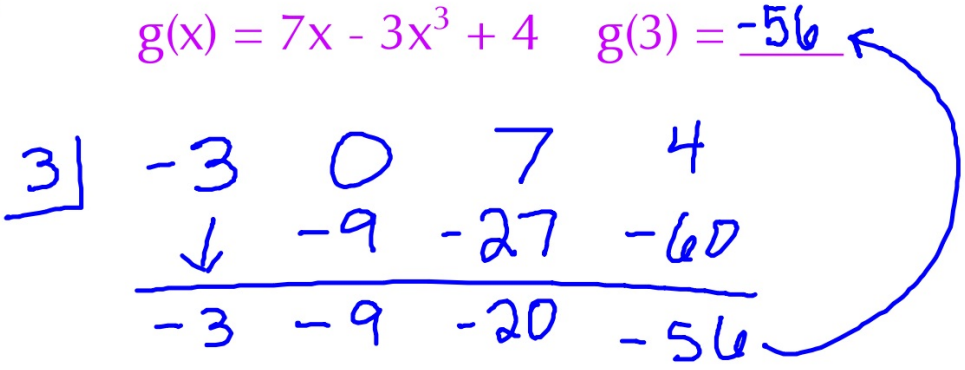
$$\begin{array}{c|ccccc} -2 & 1 & -2 & 3 & 0 & -7 \\ & \downarrow & -2 & 8 & -22 & 44 \\ \hline & 1 & -4 & 11 & -22 & \boxed{37} \end{array}$$

$g(-2) = 37$

Use synthetic substitution to evaluate the polynomial function for the given value of x.

#7

$g(x) = 7x - 3x^3 + 4 \quad g(3) = -56$



2c.) $\frac{3i}{(1+4i)^2} = \frac{3i}{(-15+8i)} \cdot \frac{(-15-8i)}{(-15-8i)} = \frac{-45i-24i^2}{225-64i^2}$

$(1+4i)(1+4i)$

$1+8i+16i^2$

$-15+8i$

$\frac{-45i+24}{225+64} = \frac{24-45i}{289}$

$a+bi$

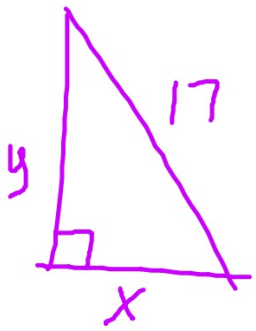
$\frac{24}{289} - \frac{45}{289}i$

2b.) $\frac{1-3i}{3i} \cdot \frac{i}{i}$

$$\frac{i-3i^2}{3i^2}$$

$$\frac{i+3}{-3} = \frac{3+i}{-3} = -1-\frac{1}{3}i$$

(6.)



$P = 40$

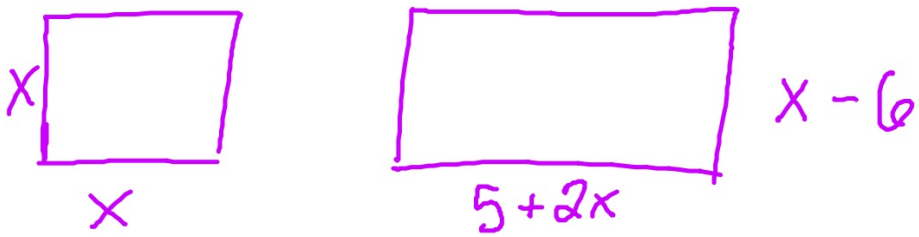
$x + y + 17 = 40$

$y = 23 - x$

$x^2 + y^2 = 17^2$

$x^2 + (23 - x)^2 = 17^2$

7.)



$$x^2 = (5+2x)(x-6)$$

15b)

$y = -2x^2 + 4x + 1$

Vertex:

$\frac{-b}{2a}$ $\quad \frac{-4}{2(-2)} = 1$

(1, 3)

AOS: $x = 1$

$D_{set}\{x | x \in \mathbb{R}\}$

$D_{int}(-\infty, \infty)$

$R_{set}\{y | y \leq 3\}$

$R_{int}(-\infty, 3]$

$y = -2x^2 + 4x + 1$

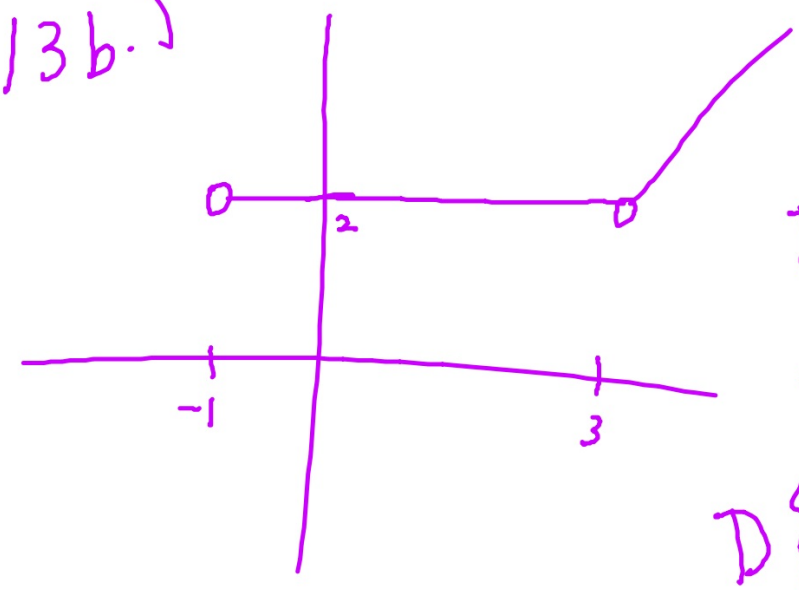
$y = (-2x^2 + 4x + \_\_) \_\_ + 1$

$= -2(x^2 - 2x + 1) 2 + 1$

$y = -2(x-1)^2 + 3$

x	y
0	1
1	3
2	1

13b.)



$D: (-1, 3) \cup (3, \infty)$

$R: [2, \infty)$

$D\{x \mid -1 < x < 3,\ x > 3\}$

$R\{y \mid y \geq 2\}$