Chapter 2: Polynomial Functions
Section 1

Polynomials

-Have nonnegative exponents

-Variables ONLY in numerator

-General Form

$$a_n x^n + a_{n-1} x^{n-1} + \ldots + a_2 x^2 + a_1 x^1 + a_0$$

Example 1

$$27x^5 + 10x^4 - 6x^3 + 2x^2 - x + 7.5$$

Terms:

$27x^5$ $10x^4$

$-6x^3$ $2x^2$

$-x$ 7.5

Coefficients:

27, 10, -6, 2, -1, and 7.5

- Always write in **descending** order
- **Leading Term** - Term with highest power $27x^5$
- **Leading coefficient** - coefficient of the leading term 27
- **Degree** of a polynomial - power of the leading term 5

DEGREE	NAME	EXAMPLE
0	constant	7
1	Linear	$7x$
2	Quadratic	$4x^2 + 7$
3	Cubic	$x^3 + 6x - 4$
4	Quartic	$5x^4 - 6x^3 + x$
5	Quintic	$18x^5 + x^3 - x - 4$

Example 2

Name the term of the polynomial $7x^4 + 10x^3 - 6x^2 + 5x + 11$

Constant: 11 Linear Term: $5x$

Quadratic Term: $-6x^2$ Cubic Term: $10x^3$

Quartic Term: $7x^4$

Zeros of a function are where P(x) = 0
(set equation = 0)

zeros → where graph crosses x-axis

Example 3

Decide if the function is a polynomial function and find the zeros.

A) f(x) = 7x - 5

yes

$7x-5=0$
$+5 \quad +5$
$\frac{7x}{7}=\frac{5}{7}$
$x=\frac{5}{7}$

B) $g(m) = m^3 - 25m$

$g(m)=m^3-25m$

yes

$m^3-25m=0$
$m(m^2-25)=0$
Diff. of squares
$m(m+5)(m-5)=0$
$m=0,-5,5$

C) $g(h)=h-\frac{1}{h}$

Not poly.

$h\left(h-\frac{1}{h}=0\right)$
$h^2-1=0$
$\sqrt{h^2}=\sqrt{1}$
$h=\pm 1$

Example 4

Given $f(x)=\frac{x^2-7x+12}{x+5}$

a) Where is the function undefined?

when denominator = 0

$x+5=0$
if $x=-5$

b) Find the zeros of the function.

$\frac{0}{\text{any}\#}=0$ ∴ set numerator = 0

$x^2-7x+12=0$
$(x-3)(x-4)$
$x=3$ $x=4$ x-intercepts

Example 5

Find the values of function $f(x) = 2x^2 + 15$.

a) $f(3) = 2(3)^2 + 15 = 2(9) + 15 = 18 + 15 = 33$

b) $f(3i) = 2(3i)^2 + 15 = 2(9i^2) + 15 = 18i^2 + 15$

$-18 + 15 = -3$

c) $f(3n) = 2(3n)^2 + 15 = 2(9n^2) + 15$

$18n^2 + 15$

d) $f(n + 3) =$

$2(n+3)^2 + 15$

FOIL

$2(n^2 + 6n + 9) + 15$

$2n^2 + 12n + 18 + 15 = 2n^2 + 12n + 33$

Example 6

$P(x) = 2x^4 - 3x^3 + x^2 + 6x - 6$

Find $P(2) = 18$

Another way to find P(x) is to use SYNTHETIC SUBSTITUTION

NOTE: You may only use synthetic substitution if x is a real number, x cannot be imaginary or a variable

2	2	-3	1	6	-6
	↓	4	2	6	24
	2	1	3	12	18 = P(2)

LAST EXAMPLE 

Use synthetic substitution to find P(5) given

$f(x) = 6x^3 + 7x - 9$

5	6	0	7	-9
	↓	30	150	785
	6	30	157	776 = P(5)

Homework
p56 #2-8 evens
#14, 16, 20, 23, 25, 26, 27