Hwk #20

1. Monomial:

A real number, a variable, or the product of a real number and variables. Variables may have exponents. a Term

Give three examples of a monomial:

$7, x, 5a^2$

2. Polynomial:

A monomial or the sum of monomials

A monomial is a polynomial with just one term

Give two examples of a polynomial:

$4x + 3$

$-7x^2 + 4x - 8$

3. a. The exponents of monomials and polynomials must be what kind of numbers?

Whole Numbers

b. The coefficients of a polynomial must be what kind of numbers?

Real Numbers

Definition	Polynomial Function
$P(x) = a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0$	where n is a nonnegative integer and the coefficients $a_n, \ldots, a_0$ are real numbers.

$y = (3x + 1)(x - 8)$

$y = 3x^2 - 23x - 8$

?

This is called expanded form

$y = 3x^2 - 23x - 8$

expanding means to eliminate parentheses by Distributive Property then combine line terms.

This is called factored form

$y = (3x + 1)(x - 8)$

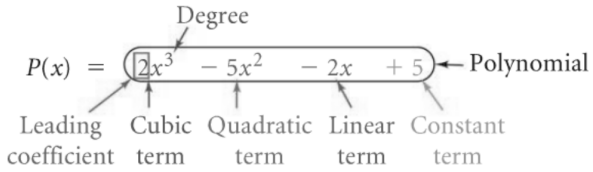
Factors are things being multiplied together and that is what this problem show. There are usually parentheses when in factored form.

4. What does a polynomial in standard form look like?
   Expanded, with terms in descending order according to their exponent (degree).

5. The leading coefficient of a polynomial is
   The coefficient of the term with the largest exponent after it's been expanded.
   If it's in Standard Form it will be the first coefficient.

6. The degree of a polynomial is
   The largest exponent after it's been expanded.
   If it's in Standard Form it will be the first exponent.

standard form of a polynomial. A one-variable polynomial in standard form has no two terms with the same degree, since all like terms have been combined.



7. Complete these two tables by filling in the blanks.

Degree of Polynomial	Name by Degree
0	Constant
1	Linear
2	Quadratic
3	Cubic

# of terms in polynomial	Name by # of terms
1	Monomial
2	Binomial
3	Trinomial

8. Is each of the below a polynomial? If not give a reason.

a) $y = \frac{3}{7}x^2 + 3x - 14x^4 + 4$

Yes.
All exponents are whole numbers and all coefficients are real numbers

b) $y = 4x^{-2} + x^3 - \frac{8}{x}$

No.
There is a negative exponent and $\frac{8}{x}$ means $8x^{-1}$

c) $y = 9\sqrt{x} + 3x^7 - x^{\frac{2}{3}}$

No.
There is a fractional exponent and $\sqrt{x}$ means $x^{\frac{1}{2}}$

d) $y = 9^x + 10ix^4 - 15$

No.
There is an imaginary coefficient and an exponent that is a varialbe.

9. a) $(x+3)^2 - 1$

Standard Form: $x^2 + 6x + 8$

Degree: 2

Leading Coefficient: 1

Name by Degree: Quadratic

Name by # of terms: Trinomial

b) $15 + 6x^3 - 3(x^2 + 5) + x^3$

Standard Form: $7x^3 - 3x^2$

Degree: 3

Leading Coefficient: 7

Name by Degree Cubic

Name by # of terms: Binomial

10. State the degree of each polynomial.

Polynomials in Expanded Form:

a) $7x^2 + 12 - 13x^4 + 8x$ Degree: 4

b) $9x + 1$ Degree: 1

c) 6 Degree: 0

Without epxanding the whole polynomial you can find the degree and leading coefficient by multiplying the leading term of each factor.

Polynomials in Factored Form:

d) $(x+3)(2x-1)$

$(x)(2x) \longrightarrow 2x^2$

Degree: 2

e) $(x-7)^2(x-5)$

$(x^2)(x) = x^3$

Degree: 3

Domain of all Polynomials is: $(-\infty, \infty)$

Definition	Polynomial Function
$P(x) = a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0$	where n is a nonnegative integer and the coefficients $a_n, \ldots, a_0$ are real numbers.

Polynomials: Exponents must be Whole Numbers

This means exponents can't be:

- Negative
- Fractions (rational #'s)
- Decimals
- Variables

This also means that the variable X can't be

- In a denominator (neg exponent)
- Under a radical (fractional exponent)
- An exponent itself

Get a small white board, rag, and marker

State the Degree and Leading Coefficient of each.

1. $y = 2x^5 - 9x^4 + 13 - 3x^5 + 7x^2$ $2x^5 - 3x^5 = -x^5$

Degree: 5

Leading Coefficient: -1

2. $f(x) = 14x^3 + x^2 - 7x^4 + 3x - 5$

Degree: 4

Leading Coefficient: -7

Without epxanding the whole polynomial you can find the degree and leading coefficient by multiplying the leading term of each factor.

State the degree and leading coefficient of each.

1. $y = (7x + 11)(9x - 15)$ Deg: 2 LC: 63

$(7x)(9x) = 63x^2$

2. $y = (2x - 7)(3x + 1)(4x - 9)$ Deg: 3 LC: 24

$(2x)(3x)(4x) = 24x^3$

State the degree and leading coefficient of each.

3. $y = (x + 5)^2(x - 3)^2$ Deg: 4 LC: 1

$(x^2)\cdot(x^2) = x^4$

4. $y = (2x + 3)(x - 2)^3(x + 6)^3$ Deg: 7 LC: 2

$(2x)(x^3)(x^3) = 2x^7$

State the degree and leading coefficient of each.

5. $y = -2x(2x - 5)^3(3x + 1)^2$ Deg: 6 LC: -144

$(-2x)(2x)^3(3x)^2$

$(-2x)(8x^3)(9x^2) = -144x^6$

6. $y = (2x + 9)^2(2 - 5x)^3(4 - 3x)^2$ Deg: 7 LC: -4500

$(2x)^2(-5x)^3(-3x)^2$

$(4x^2)(-125x^3)(9x^2) = -4500x^7$

What will be most important for Chapter 6 is whether the Leading Coefficient is either

Positive or Negative

What will be most important for Chapter 6 is whether the Degree of a Polynomial is either

Odd or Even

For each polynomial state if the:

Degree is EVEN or ODD
and
Leading Coefficient is POS or NEG

1. $y = 4x^2(x+3)^2(11-2x)(4x+1)^3$

$(4x^2)(x)^2(-2x)(4x)^3$

DEG: Odd/Even

Add the exponents:

2+2+1+3 = 8

LC: Pos/Neg

$(+)(+)^2(-)(+)^3$

(+)(+)(-)(+) = Neg

to determine if the Leading Coefficient is POS or NEG you only have to analyze the product of the sign of the leading coeff of each factor.

2. $y = -5x(7x-8)(2x+3)^2(9x-10)$

$(-5x)(7x)(2x)^2(9x)$

DEG: (Odd)/Even

Add the exponents:
1 +1+2+1= 5

LC: Pos/(Neg)

$(-)(+)(+)^2(+)$

(-)(+)(+)(+) = Neg

3. $y = -3x^2(5x-6)^3(2-x)^2(7-4x)(8-3x)^3$

$(-x^2)(+x)^3(-x)^2(-x)(-x)^3$

DEG: (Odd)/Even

add exponents:
2+3+2+1+3 = 11

LC: Pos/(Neg)

$(-)(+)^3(-)^2(-)(-)^3$

(-)(+)(+)(-)(-) = Neg

4. $y = 7x^4(4x-9)^3(x^2+6)^3(9-2x)^2(x+7)(3x-5)^2$

$(+x^4)(+x)^3(+x^2)^3(-x)^2(x)(+x)^2$

$(+x^4)(+x^3)(+x^6)(+x^2)(x)(+x^2)$

DEG: Odd/(Even)

add exponents:
4+3+6+2+1+2 = 18

LC: (Pos)/Neg

$(+)(+)(+)(+)(+)(+) =$ Pos

You can now finish Hwk #21 Sec 6-1

Practice Sheet