Exponents, Polynomials, and Polynomial Functions

Product rule: $a^m \cdot a^n = a^{m+n}$

Zero exponent: $a^\circ = 1$, $a \neq 0$

Quotient rule: $a^m/a^n = a^{m-n}$

Negative exponent: $a^{-n} = 1/a^n$

A positive number is written in **scientific notation** if it is written as the product of a number *a,* where $1 \leq a \leq 10$, and an integer power of 10: $a \times 10^r$.

Power rules:

$$(a^m)^n = a^{m \cdot n}$$

$$(ab)^m = a^m b^m$$

$$(a/b)^m = a^m/b^m$$

A polynomial is a finite sum of terms in which all variables have exponents raised to nonnegative integer powers and no variables appear in the denominator.

A function P is a **polynomial function** if P(x) is a polynomial.

Factoring

To factor $ax^2 + bx + c$:

1. Write all pairs of factors of ax^2
2. Write all pairs of factors of c.
3. Try combinations of these factors until the middle term bx is found.

Perfect square trinomial:

$$a^2 + 2ab + b^2 = (a + b)^2$$

$$a^2 - 2ab + b^2 = (a - b)^2$$

Difference of two squares:

$$a^2 - b^2 = (a + b)(a - b)$$

Sum and difference of two cubes:

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

To factor a polynomial:

1. Factor out the *GCF.*
2. If the polynomial is a binomial, see if it is a *difference* of two squares or a sum or *difference* of two cubes. If it is a trinomial, see if it is a perfect square trinomial. If not, try other factoring methods. If it is a polynomial with 4 or more terms, try factoring by grouping.
3. See if any factors can be factored further.

To solve polynomial equations by factoring:

1. Write the equation so that one side is 0.
2. Factor the polynomial completely.
3. Set each factor equal to 0.
4. Solve the resulting equations.
5. Check each solution.

A quadratic function is a function that can be written in the form

$$f/(x) = ax^2 + bx + c;\ a \neq 0$$

The graph of this quadratic function is a parabola with vertex

$$\left(\frac{b}{2a}\right),\ f\left(\frac{-b}{2a}\right)$$