3.1 Rules of Exponents

Product rule

Quotient rule

Power rule

Products or quotients raised to exponents

Negative exponents

Zero as an exponent

Simplify the following expressions.

a. $h^4 h^7 h^3$

b. $(5a^4b^3)(6a^2b^8)$

Simplify the following expressions.

a. $\dfrac{m^4 n^8}{m^3 n^2}$

b. $\dfrac{24x^6 y^5}{9xy^3}$

Simplify the following expressions.

a. $(x^3y^2z^5)^4$

b. $\left(\frac{3a^4b^6}{5c^2}\right)^3$

Simplify the following expressions.

a. $(2m^4n^7)^3(5mn^3)^2$

b. $\left(\frac{6x^2z^5}{xy^3z^2}\right)^2\left(\frac{2xy^3}{xz}\right)^3$

Simplify the following expressions. Write all answers without negative exponents.

a. a^2b^{-3}

b. $\dfrac{-40x^2y^{-3}z^{-5}}{6x^{-4}y^4z^{-2}}$

Simplify the following expressions. Write all answers without negative exponents.

a. $(285x^{43}y^{-8}z)^0$

b. $(5g^2h^{-4})^{-2}(3g^{-1}h)^2$

c. $\left(\dfrac{-30\,j^2k^{-2}}{-12\,j^{-5}k^4}\right)^{-3}$

3.2 Combining Functions

Term – A constant, a variable, or the product of any number of constants and variables. They can include exponents.

Coefficient – The constant part of any term. It is usually at the front of any term and includes the sign of the term.

Polynomial – A term or any combination of terms that are added together. The exponents must all be whole numbers.

Determine the number of terms and identify the coefficients of each term.

a. $5x^2 - 10x - 20$

b. $-4a^3b^5 + 200$

Determine if the given expression is a polynomial. If the expression is not a polynomial explain why not.

a. $8\sqrt{a}+7a-4$

b. $8m^2n^5-9mn^4$

c. $5g+\frac{2}{h}-7$

For the given expressions, list the degree of each term and of the entire polynomial.

a. $5t^2 + 6t - 8$

b. $5a^4b^3 + 7a^2b^2 - 8b^5$

Combine the following functions using:

$$f(x) = 3x + 8 \qquad g(x) = 4x - 10$$

a. $f(x) + g(x)$

b. $f(x) - g(x)$

Perform the indicated operations and simplify.

a. $(8x^3 + 7x^2 - 6x) - (3x^2 + 4x - 7)$

b. $(3a + 7)(4a - 5)$

The revenue and cost for Build It Right Construction to build homes in a new development can be modeled by the following functions.

$$R(h) = -0.007h^2 + 0.37h - 1.04$$

$$C(h) = -0.005h^2 + 0.23h - 0.68$$

where $R(h)$ is the revenue in millions of dollars from selling h homes and $C(h)$ is the cost in millions of dollars to build h homes.

a. Find the revenue and cost for Build It Right Construction to build 12 homes in this new development.

b. Find a new function that will give the profit in millions of dollars for Build It Right Construction when they build h houses in this new development.

$$R(h) = -0.007h^2 + 0.37h - 1.04$$

$$C(h) = -0.005h^2 + 0.23h - 0.68$$

$$P(h) = -0.002h^2 + 0.14h - 0.36$$

c. Use the new profit function to find the profit for 25 houses.

3.4 Factoring Polynomials

Greatest common factor (GCF)

- Look for the largest number that divides into the coefficients
- If there are common variables, choose the smaller exponent term to factor out

Factor out the greatest common factor:

a. $6a^2 + 10a$

b. $8x^3y^2 - 7x^2y$

c. $3y(y+4) - 5(y+4)$

Factor by Grouping

1. Use when polynomial is 4 terms
2. Take out the GCF
3. Group the first two terms and last two terms
4. Factor out the GCF from 1st group
5. Factor out the GCF from 2nd group
6. Factor out the GCF from the remaining expression

Factor by grouping:

a. $6p^2 - 10p + 15p - 25$

b. $8m^2 + 12mn - 10m - 15n$

Factoring Trinomials (a=1)

Factoring Trinomials of the form $ax^2 + bx + c$ where a=1
Find a pair of numbers that multiply to c and add to b call them p and q, the factored form is (x + p)(x + q)

Factor the following.

a. $x^2 + 9x + 14$

c. $x^2 + 7x - 18$

b. $x^2 - 5x - 24$

d. $3x^2 - 9x - 162$

Factoring Trinomials (a≠1)

Factoring Trinomials of the form $ax^2 + bx + c$ where a≠1 can use AC Method, Trial and Error, X method, Fake factoring, box method, etc.

AC Method – watch the media

Take out GCF. Multiply the a and c coefficients. Find a pair of numbers that multiply to "ac" and add to b. Use these numbers to split up the middle term and factor by grouping.

Factor $6x^2 + 7x + 2$

Trial and Error Method – Take out the GCF. Use the first and last term to create potential factors and FOIL to check that the combination also produces the correct middle term.

a. Factor completely: $15x^2 + 23x - 28$

b. Factor completely: $4x^2 - 7x + 3$

Factor the following. Use any method. Don't forget to take out GCF first!

a. $12x^3 - 87x^2 + 21x$

b. $2x^2y - 11xy - 40y$

Factor the following completely using any method.

a. $x^2 + 4x - 21$

b. $12x^2 - 43x + 35$

3.5 Special Factoring Techniques

Difference of Squares – a binomial with ends that are perfect squares and a minus sign between

Factor the following.

a. $x^2 - 64$

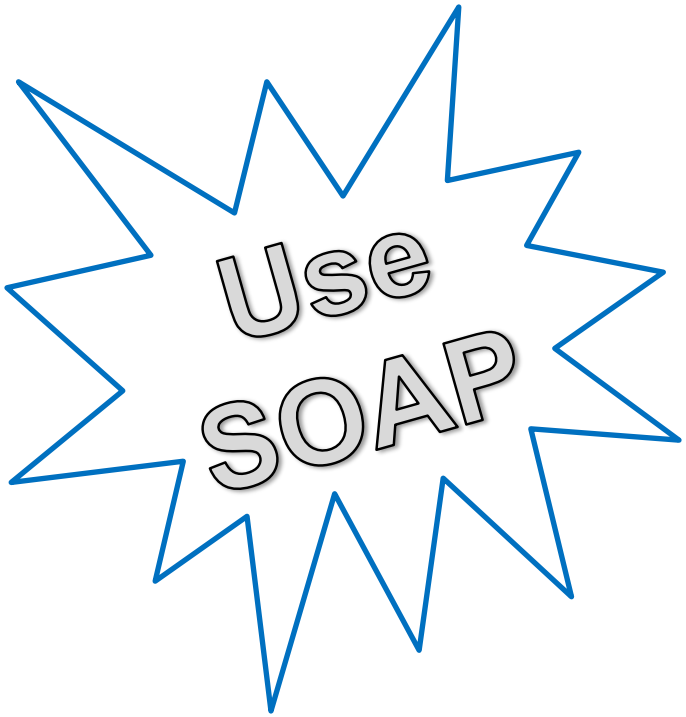
b. $25a^2 - 4b^2$

Difference and Sum of Cubes – a binomial with ends that are perfect cubes. They can be factored using the following format:

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

OR

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



Factor the following:

a. $y^3 + 64$

b. $27m^3 - 8n^3$