

Lesson 20

Foundations of College Algebra

Function Notation

Definition – Function Notation

For the function $y = f(x)$:

f is the name of the function,
 x is the independent variable,
 y is the dependent variable.

We read $f(x)$ as “ f of x ” or “the value of f at x ”.

Examples

For the function $f(x) = 5x - 3$, evaluate the function.

- $f(2)$
- $f(-1)$

For the function $f(x) = 2x^2 + 3x - 1$, evaluate the function.

- $f(3)$
- $f(-2)$

You Try It

For the function $f(x) = 3x + 4$, evaluate the function.

1. $f(2)$
2. $f(-1)$

For the function $2x^2 - x + 3$, evaluate the function.

3. $f(3)$
4. $f(-2)$

Exponential Expressions

Review

Remember that an exponent indicates repeated multiplication of the same quantity.

$$a^m = \underbrace{a \cdot a \cdot a \cdot \dots \cdot a}_{m \text{ factors}}$$

You Try It

Simplify.

1. 4^3
2. $(-5)^4$

Product Property for Exponents

Fact

If a is a real number and m and n are counting numbers, then

$$a^m \cdot a^n = a^{m+n}.$$

To multiply with like bases, add the exponents.

Examples

Simplify each expression using the Product Property for Exponents.

- $d^3 \cdot d^6$
- $q^{27} \cdot q^{15}$
- $w \cdot w^2 \cdot w^3$

You Try It

Simplify each expression using the Product Property for Exponents.

1. $x^4 \cdot x^2$
2. $n^{19} \cdot n^{12}$
3. $y \cdot y^3 \cdot y^5$

Power Property for Exponents

Fact

If a is a real number, and m and n are whole numbers, then

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

To raise a power to a power, multiply the exponents.

Examples

Simplify each expression using the Power Property of Exponents.

- $(x^2)^3$
- $(y^5)^9$

You Try It

Simplify each expression using the Power Property of Exponents.

1. $(m^4)^2$
2. $(b^2)^7$

Product to a Power Property

Fact

If a and b are real numbers and m is a whole number, then

$$(a \cdot b)^m = a^m \cdot b^m.$$

To raise a product to a power, raise each factor to that power.

Examples

Simplify each expression using the Product to a Power Property.

- $(6a)^2$
- $(-4m)^3$
- $(3xyz)^4$

You Try It

Simplify each expression using the Product to a Power Property.

1. $(5x)^2$
2. $(-7n)^3$
3. $(5ab)^3$

Using the Properties Together

Examples

Simplify each expression.

- $(y^2)^4 \cdot (y^3)^2$
- $(10a^2b)^3$
- $(3pq^4) \cdot (6p^6q)^2$

You Try It

Simplify each expression.

1. $(y^2)^4 \cdot (y^3)^2$
2. $(10a^2b)^3$
3. $(3pq^4) \cdot (6p^6q)^2$

Quotient Property for Exponents

Fact

If a is a real number, $a \neq 0$, and m and n are whole numbers, then

$$\frac{a^m}{a^n} = a^{m-n}, m > n \text{ and } \frac{a^m}{a^n} = \frac{1}{a^{n-m}}, n > m.$$

Examples

Simplify.

$$\bullet \frac{x^9}{x^7}$$

$$\bullet \frac{y^{43}}{y^{37}}$$

$$\bullet \frac{b^8}{b^{12}}$$

$$\bullet \frac{x^{18}}{x^{22}}$$

Examples

Simplify.

$$1. \frac{x^{18}}{x^3}$$

$$2. \frac{y^{20}}{y^{10}}$$

$$3. \frac{q^{18}}{q^{36}}$$

$$4. \frac{t^{10}}{t^{40}}$$

Zero Exponent

Fact

If a is a non-zero number, then $a^0 = 1$.

Examples

Simplify.

$$\bullet (25x)^0$$

$$\bullet 25x^0$$

You Try It

Simplify.

$$1. (12x)^0$$

$$2. (-56p^4q^3)^0$$