

# Chapter 4: Polynomials



4.1: Rules for Exponents



4.2: Zero and Negative Exponents



4.3: Scientific Notation



4.4: Polynomials



4.5: Adding/ Subtracting Polynomials



4.6: Multiplying Polynomials



4.7: Division of Polynomials (Monomials)



## 4.1: Rules for Exponents

$2^4$  2 is the base and 4 is the exponent

$$2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$$

**Example:**

**Simplify:**  $2^3 \cdot 2^5$

**Solution:**

$$\begin{aligned} &2^3 \cdot 2^5 \\ &(2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2 \cdot 2 \cdot 2) \\ &2^8 \end{aligned}$$

**Practice Example:**

**Simplify:**  $3^2 \cdot 3^8$

$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$$

$$3^{2+8} = \boxed{3^{10}}$$

When multiplying exponential expressions with the same base, what is the short cut to simplify the expression?

Varies

---

---

## Properties of Exponents

$$x^a \cdot x^b = x^{a+b}$$

Examples:

a.  $(-5)^6(-5)^8$

$$(-5)^{14}$$

b.  $x^5x^3$

$$xxxxx \quad xxx$$

$$x^8$$

c.  $x^7y^2x^6y^1$

$$x^{13}y^3$$

d.  $(4a^7b^3)(-3a^2b^4)$

$$-12a^9b^7$$

e.  $(x-4)^3(x-4)^5$

$$(x-4)^8$$

Example:

Simplify:  $\frac{3^5}{3^3}$

Solution:

$$\frac{3^5}{3^3}$$

$$\frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 3 \cdot 3}$$

$$\frac{\cancel{3} \cdot \cancel{3} \cdot \cancel{3} \cdot 3 \cdot 3}{\cancel{3} \cdot \cancel{3} \cdot \cancel{3}}$$

$$3^2$$

Practice Example:

Simplify:  $\frac{4^9}{4^6}$

$$\frac{\cancel{4} \cancel{4} \cancel{4} \cancel{4} \cancel{4} \cancel{4} \cancel{4} 4 4 4}{\cancel{4} \cancel{4} \cancel{4} \cancel{4} \cancel{4} \cancel{4}}$$

$$4^3$$

When dividing exponential expressions with the same base, what is the short cut to simplify the expression?

Varies

---

---

## Properties of Exponents

$$\frac{x^a}{x^b} = x^{a-b}$$

Examples:

a.  $\frac{(-3)^7}{(-3)^3} = (-3)^4$

b.  $\frac{x^5}{x^2} = x^3$

c.  $\frac{10x^{12}y^9z^4}{2x^8yz^4}$

$$\boxed{5x^4y^8z}$$

d.  $\frac{-6a^3b^5}{9a^4b^5c^4c^2}$

$$\frac{-2}{3ac^6}$$

Example:

Simplify:  $(5^3)^4$

Solution:

$$(5^3)^4$$

$$(5^3)(5^3)(5^3)(5^3)$$

$$(5 \cdot 5 \cdot 5)(5 \cdot 5 \cdot 5)(5 \cdot 5 \cdot 5)(5 \cdot 5 \cdot 5)$$

$$5^{12}$$

Practice Example:

Simplify:  $(2^5)^3$

$$(2^5)(2^5)(2^5)$$

$$(2 \cdot 2 \cdot 2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2 \cdot 2 \cdot 2)$$

$$2^{5 \cdot 3} = \boxed{2^{15}}$$

When raising exponential expressions to a power, what is the short cut to simplify the expression?

Varies

---

---

## Properties of Exponents

$$(x^a)^b = x^{a \cdot b}$$

Examples:

a.  $(10^5)^{12} = 10^{60}$

b.  $(x^3)^7 = x^{21}$

c.  $(2x^3y^4z)^3 = 2^3(x^3)^3(y^4)^3(z)^3$   
 $(2x^3y^4z)(2x^3y^4z)(2x^3y^4z)$   
 $8x^9y^{12}z$

d.  $(-3a^2b^8)^4$   
 $(-3)^4(a^2)^4(b^8)^4$   
 $81a^8b^{32}$

e.  $\left(\frac{3a^5b^2}{2c^4}\right)^3$   
 $\left(\frac{3a^5b^2}{2c^4}\right)\left(\frac{3a^5b^2}{2c^4}\right)\left(\frac{3a^5b^2}{2c^4}\right)$   
 $\frac{3^3(a^5)^3(b^2)^3}{2^3(c^4)^3}$   
 $\frac{27a^{15}b^6}{8c^{12}}$

## 4.1: Rules for Exponents Practice Problems

1.  $3^4 \cdot 3^7$

$$3^{11}$$

2.  $(-2)^5(-2)^2$

$$(-2)^7$$

3.  $a^2 a^3 a$

$$a^6$$

4.  $x^2 x^8 y^7 y^2$

$$x^{10} y^9$$

5.  $ab^3 c^5 a^{10} c^2 b d^7$

$$a^{11} b^4 c^7 d^7$$

6.  $(4)^2(-6)^3(4)^6(-6)$

$$(4)^8(-6)^4$$

7.  $(-6x^2 y^4)(4x^6 y)$

$$-24x^8 y^5$$

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

$$(5x^2 - 3y)^6$$

9.  $\theta^3 \psi^4 \alpha \theta^5 \psi^2$

$$\theta^8 \psi^6 \alpha$$

10.  $\frac{7^8}{7^3}$

$$7^5$$

11.  $\frac{3^5(-8)^3}{3^2(-8)}$

$$3^3(-8)^2$$

$$27(16) =$$

$$432$$

12.  $\frac{a^{12}}{a^4}$

$$a^8$$



## 4.1: Rules for Exponents Practice Problems Continue

13.  $\frac{16b^{10}c^9d}{8b^5cd}$

$$\boxed{2b^5c^8}$$

14.  $\frac{-2x^7x^3y^5}{4x^4y^3yz^2}$

$$-\frac{x^{10}y^5}{2x^4y^4z^2}$$

$$\boxed{-\frac{x^6y}{2z^2}}$$

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

$$\boxed{a^8b^3c^2}$$

16.  $(2^3)^4$

$$\boxed{2^{12}}$$

17.  $(x^5)^6$

$$\boxed{x^{30}}$$

18.  $(3x^2)^3$

$$\boxed{27x^6}$$

19.  $(4x^7y^5z)^2$

$$\boxed{16x^{14}y^{10}z^2}$$

20.  $(-2a^3bc^5)^5$

$$\boxed{-32a^{15}b^5c^{25}}$$

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

$$\boxed{\frac{25a^4b^6}{c^8d^{10}}}$$

22.  $\left(\frac{12a^5a^2}{4a^6b}\right)^3$

$$\left(\frac{3a^7}{a^6b}\right)^3$$

$$\left(\frac{3a}{b}\right)^3$$

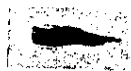
$$\boxed{\frac{27a^3}{b^3}}$$

23.  $\left(\frac{-4x^3y^4x^5}{12x^4x^2y}\right)^2$

$$\left(\frac{-1x^8y^4}{3x^6y}\right)^2$$

$$\left(\frac{-1x^2y^3}{3}\right)^2 =$$

$$\boxed{\frac{1x^4y^6}{9}}$$



## 4.2: Zero and Negative Exponents

Example:

Simplify:  $\frac{2^4}{2^4}$

One Solution:

$$\frac{2^4}{2^4} = 2^{4-4} = 2^0$$

What is a base raised to 0?

$$\frac{2^4}{2^4}$$

$$\frac{2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 2}$$

$$\frac{2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 2} = 1$$

$$2^0 = 1$$

Practice Example:

Simplify:  $(-5)^0 = 1$

When raising an exponential expression to zero, what is the simplified expression (except for 0 and infinity)?

1

---

## Properties of Exponents

$$b^0 = 1$$

Examples:

a.  $(x^3)^0 = 1$

b.  $\left(\frac{5x^{100}y^{20}z^{151}}{a^{15}b}\right)^0 = 1$

c.  $x^0 + 2$   
 $1 + 2 = \boxed{3}$

d.  $3x^0$   
 $3(1) = 3$

$$(3x)^0 = 1$$

e.  $(2x^5y^0)^3$   
 $(2x^5 \cdot 1)^3$   
 $(2x^5)^3$   
 $\boxed{8x^{15}}$

f.  $(5a^5b^3)^0(4a^6b^0)$   
 $(1)(4a^6 \cdot 1)$   
 $\boxed{4a^6}$

**Example:**

Simplify:  $\frac{3^2}{3^6}$

**One Solution:**

$$\frac{3^2}{3^6} = 3^{2-6} = \boxed{3^{-4}}$$

What do we do with a negative exponent?

$$\frac{3^2}{3^6}$$

$$\frac{3 \cdot 3}{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}$$

$$\frac{\cancel{3} \cdot \cancel{3}}{\cancel{3} \cdot \cancel{3} \cdot 3 \cdot 3 \cdot 3 \cdot 3}$$

$$\boxed{\frac{1}{3^4}}$$

So,

$$3^{-4} = \frac{1}{3^4}$$

**Practice Example:**

Simplify:  $\frac{2^3}{2^9} = 2^{3-9} = 2^{-6} = \frac{1}{2^6}$

How do we make a negative exponent positive?

*Writes*

---

---

## Properties of Exponents

$$b^{-1} = \frac{1}{b}$$

Examples:

a.  $6^{-3}$

$$\frac{1}{6^3}$$

b.  $\frac{1}{7^{-2}} = 7^2$

c.  $\frac{x^{-2}y^5}{z^{-1}}$

$$= \frac{y^5 z^1}{x^2}$$

d.  $\frac{-3x^5y^{-2}z^{-3}}{x^{-2}y^{-4}z^4}$

$$\frac{-3x^5x^2y^4}{y^2z^3z^4}$$

$$\frac{-3x^7y^2}{z^7}$$

e.  $(-4)^{-1}$

$$\frac{1}{(-4)^1}$$

f.  $\left(\frac{3x^{-2}y^0}{z^5}\right)^{-2}$

$$\left(\frac{3}{x^2z^5}\right)^{-2}$$

$$\left(\frac{x^2z^5}{3}\right)^2$$

$$\frac{3^{-2}}{(x^2)^{-2}(z^5)^{-2}}$$

$$\frac{x^4z^{10}}{3^2} = \boxed{\frac{x^4z^{10}}{9}}$$

$$\frac{3^{-2}}{x^{-4}z^{-10}} = \frac{x^4z^{10}}{3^2}$$

## 4.2: Zero and Negative Exponents Practice Problems

1.  $5^0$

$$\boxed{1}$$

2.  $b^0$

$$\boxed{1}$$

3.  $5^0 + b^0$

$$1 + 1 = 2$$

$$\boxed{2}$$

4.  $\left(\frac{-121a^{55}b^{38}c^{45}}{247x^{17}y^{68}z}\right)^0$

$$\boxed{1}$$

5.  $(-2)^0 x$

$$1x$$

$$\boxed{x}$$

6.  $(5a^2b^0c^3)^2$

$$(5a^2c^3)^2$$

$$\boxed{25a^4c^6}$$

7.  $(2x^0y^5)^4(3x^7y^0)^0$

$$(2y^5)^4(1)$$

$$(2y^5)^4$$

$$\boxed{16y^{20}}$$

8.  $\frac{6^2}{6^3}$

$$\boxed{\frac{1}{6}}$$

9.  $\frac{x^7}{x^{10}}$

$$\boxed{\frac{1}{x^3}}$$

## 4.2: Zero and Negative Exponents Practice Problems Continue

10.  $3^{-2}$

$$\frac{1}{3^2}$$

$$\boxed{\frac{1}{9}}$$

11.  $x^{-5}$

$$\boxed{\frac{1}{x^5}}$$

12.  $\frac{1}{5^{-2}a^{-3}}$

$$5^2 a^3$$

$$\boxed{25a^3}$$

13.  $\frac{a^{-4}b^{-2}}{c^{-3}}$

$$\boxed{\frac{c^3}{a^4 b^2}}$$

14.  $\frac{x^{-3}y^7z^{-1}}{-2a^6b^{-3}d}$

$$\boxed{\frac{b^3 y^7}{-2a^6 d x^3 z}}$$

15.  $(3x^5y^{-3})(2x^{-3}y^2)$

$$\left(\frac{3x^5}{y^3}\right)\left(\frac{2y^2}{x^3}\right)$$

$$\boxed{\frac{6x^2}{y}}$$

16.  $(2)^{-3}$

$$\frac{1}{2^3}$$

$$\boxed{\frac{1}{8}}$$

17.  $(4x^3y^{-4})^{-2}$

$$\left(\frac{4x^3}{y^4}\right)^{-2}$$

$$\left(\frac{y^4}{4x^3}\right)^2 = \boxed{\frac{y^8}{16x^6}}$$

18.  $\left(\frac{12x^5y^{-3}z^{-1}}{4x^{12}y^6z^{-9}}\right)^{-4}$

$$\left(\frac{12x^5z^9}{4y^3z^{12}x^{12}y^6}\right)^{-4}$$

$$\left(\frac{3z^8}{x^7y^9}\right)^{-4}$$

$$\left(\frac{x^7y^9}{3z^8}\right)^4 = \boxed{\frac{x^{28}y^{36}}{81z^{32}}}$$



## 4.3: Scientific Notation

### Why do we use scientific notation?

Scientists often deal with extremely large and small numbers.

For example, the distance from the earth to the sun is 150,000,000 kilometers (93,750,000 miles) apart.

Another example is the diameter of the influenza virus is 0.00000256 inch.

**Standard Form:**

2,500,000.

$2.5 \times 10^6$

**Scientific Notation:**

$2.5 \times 10^6$

2,500,000

---

**Standard Form:**

0.000123

$1.23 \times 10^{-4}$

**Scientific Notation:**

$1.23 \times 10^{-4}$

0.000123

---

**Scientific Notation:**

$-3.25 \times 10^5$

**Standard Form:**

-325,000

---

**Scientific Notation:**

$5 \times 10^{-7}$

5.

**Standard Form:**

0.0000005

---



**Practice Examples:**

Convert to scientific notation:

a.  $3,650,000,000$   $3.65 \times 10^9$

b.  $0.0093$   $9.3 \times 10^{-3}$   
009.3

c.  $-0.000000004$   $-4.0 \times 10^{-9}$

Convert to standard notation:

a.  $4.56 \times 10^4$   $45,600$

b.  $1.2 \times 10^{-5}$   $0.000012$

c.  $-5 \times 10^{-2}$   $-0.05$

**Why do we use scientific notation?**

Varies

---

---

### 4.3: Scientific Notation Practice Problems

Convert to scientific notation:

1. ~~2,500,000~~

$$2.5 \times 10^6$$

2. -0.000004653

$$-4.653 \times 10^{-6}$$

3. 0.0012

$$1.2 \times 10^{-3}$$

4. -5,000,000,000

$$-5 \times 10^9$$

Convert to standard notation:

5.  $1.3 \times 10^6$

~~1,300,000~~

$$1,300,000$$

6.  $-6.25 \times 10^{-5}$

~~0.0000625~~

$$-0.0000625$$

7.  $-3.27 \times 10^{10}$

~~3.27~~

$$0.0000000000327$$

8.  $3 \times 10^{-7}$

~~3~~

$$30000000$$



## 4.4: Polynomials

### What is a polynomial?

**Polynomial-** is an expression written as a sum of terms.

Ex.  $5x^2y + 3x - 4y + 2$ ,  $10x^2 - 4$ ,  $5a^2b^3c^7d$ ,  $3x^2 - 4x + 6$

**Monomial-** polynomial with 1 term

Ex.  $x^2y$ ,  $-4$ ,  $3a^2b^3c^7d$ ,  $6x$

**Binomial-** polynomial with 2 terms

Ex.  $5x^2y + 3x^5$ ,  $x - 4$ ,  $5a^2b^3c^7d + 6x^2y^5z^3$ ,  $3x^2 - 5x$

**Trinomial-** polynomial with 3 terms

Ex.  $4x^3y^2 - 5x^2y + 3x^5$ ,  $x^2 + 2x - 4$ ,  $9a^2b^3 + 8x^2y^5 - 7$

**Polynomial with \_\_\_\_\_ terms-** polynomial with more than 3 terms

Ex. Polynomial with 4 terms:  $x^3 - 5x^2 + 3x - 1$

Ex. Polynomial with 5 terms:  $5x^4y - 8x^2y^3 + 6x - 15$

What type of Polynomial are these?

$$x^2 + 2x + 1$$

Trinomial

$$5x^3 - 4x^2$$

Binomial

$$12a^2b^3c^7dx^2y^5z^3$$

Monomial

$$6x^3 - 5x^3$$

Monomial

$$\boxed{x^3}$$

**Degree of a term:** of a polynomial in one variable is the value of the exponent on the variable. If a polynomial is in more than one variable, the degree of a term is the sum of the exponents on the variables. The degree of a nonzero constant is 0

**Degree of a polynomial:** the highest degree of any term of the polynomial.

**Example:**

Given the polynomial:  $4x^7 - 2x^4y^2 - 6x^2y + 3y^3$

List the terms:

$4x^7, -2x^4y^2, -6x^2y, 3y^3$

List the coefficients of each term:

$4, -2, -6, 3$

Find the degree of each term:

$7, 6, 3, 3$

Find the degree of the polynomial:

$7$

**Practice Example:**

Given the polynomial:  $ab + 6a^3b^2 - 4ab^7 + 8$

List the terms:

$ab, 6a^3b^2, -4ab^7, 8$

List the coefficients of each term:

$1, 6, -4, 8$

Find the degree of each term:

$2, 5, 8, 0$

Find the degree of the polynomial:

$(8) 8$

**Evaluate a polynomial:**

**Evaluate:**  $-2x^2 + x - 5$  when  $x = -1$

$$-2(-1)^2 + (-1) - 5$$

$$-2(1) + -1 - 5$$

$$-2 + -1 - 5$$

$$-3 - 5$$

$$\boxed{-8}$$

**Evaluate:**  $|x-5| - x^2$  when  $x = -2$

$$|(-2)-5| - (-2)^2$$

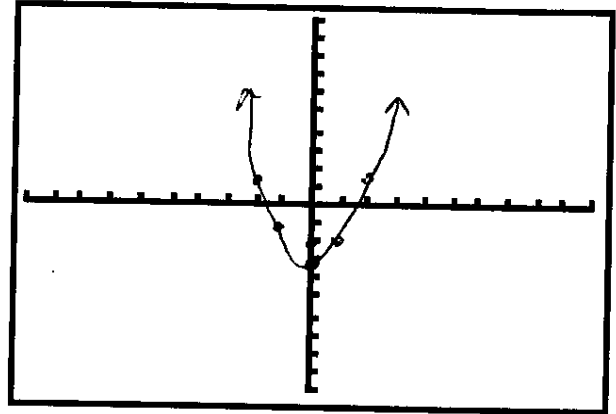
$$|-7| - 4$$

$$7 - 4 = \textcircled{3}$$

**Graphing nonlinear equations:**  
Use the table of values

Graph:  $x^2 - 3$

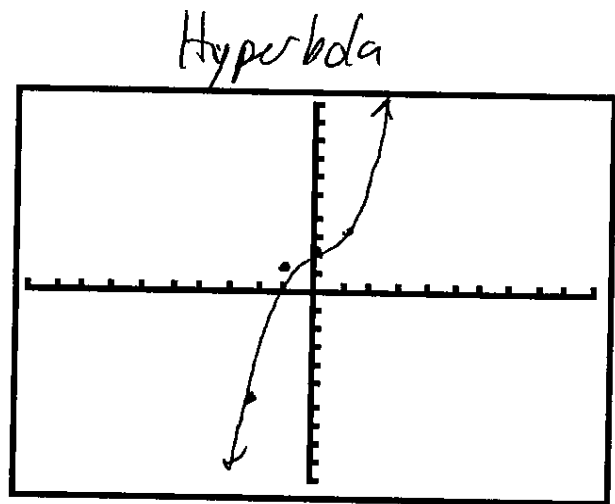
x	y
-2	1
-1	-2
0	-3
1	-2
2	1



Parabola

Graph:  $x^3 + 2$

x	y
-2	-6
-1	1
0	2
1	3
2	10



Hyperbola

**What is a polynomial?**

Varies

---

---

## 4.4: Polynomials Practice Problems

1. What types of Polynomial are these?

Choices: monomial, binomial, trinomial, polynomial with \_\_\_\_ terms

- a.  $4x^2y^5z + 2x^7y^6$  Binomial
- b.  $x^2$  Monomial
- c.  $3a^2b + 4a^2b - a^2b - 7a^2b$  Monomial
- d.  $5x^2 - 3x + 6$  Trinomial ↳  $-a^2b$
- e.  $x^3 - 2x^2 + 3x + 6$  Polynomial with 4 terms

2. Given the polynomial:  $3x^2 - 5x + 7$

- a. List the terms:  $3x^2, -5x, 7$
- b. List the coefficients of each term:  $3, -5, 7$
- c. Find the degree of each term:  $2, 1, 0$
- d. Find the degree of the polynomial:  $2$

3. Given the polynomial:  $a^6 + 9a^5b^3 - 2a^{10}b - 8b^3 + 3$

- a. List the terms:  $a^6, 9a^5b^3, -2a^{10}b, -8b^3, 3$
- b. List the coefficients of each term:  $1, 9, -2, -8, 3$
- c. Find the degree of each term:  $6, 8, 11, 3, 0$
- d. Find the degree of the polynomial:  $11$

## 4.4: Polynomials Practice Problems Continue

Evaluate questions 4 to 7

4.  $x^2 + 2x + 1$  when  $x = -1$

$$(-1)^2 + 2(-1) + 1$$

$$1 - 2 + 1$$

$$-1 + 1$$

$$\boxed{0}$$

5.  $-3x^2 - x + 7$  when  $x = -2$

$$-3(-2)^2 - (-2) + 7$$

$$-3(4) + 2 + 7$$

$$-12 + 2 + 7$$

$$-10 + 7 = \boxed{-3}$$

6.  $-2xy - x^3$  when  $x = -3, y = -2$

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

$$-12 - (-27)$$

$$-12 + 27$$

$$\boxed{15}$$

7.  $|x-5| + |xy| - |y|$  when  $x = 2, y = -1$

$$|2-5| + |2(-1)| - |-1|$$

$$|-3| + |-2| - |-1|$$

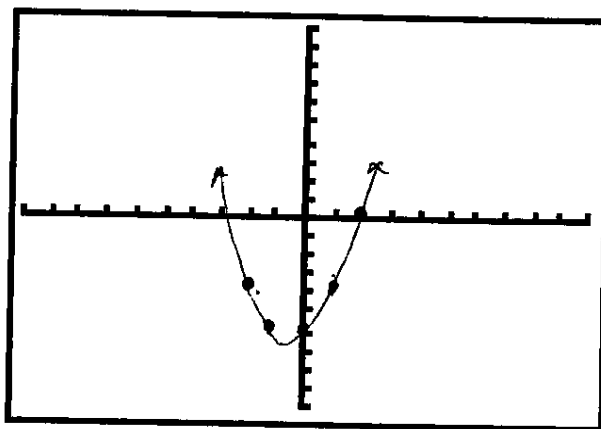
$$3 + 2 - 1$$

$$5 - 1$$

$$\boxed{4}$$

8. Graph:  $x^2 + x - 6$

x	y
-2	-4
-1	-6
0	-6
1	-4
2	0



$$x = -2$$

$$(-2)^2 + (-2) - 6$$

$$4 + (-2) - 6$$

$$2 - 6$$

$$-4$$

$$x = -1$$

$$(-1)^2 + (-1) - 6$$

$$1 + (-1) - 6$$

$$0 - 6$$

$$-6$$

$$x = 0$$

$$0^2 + 0 - 6$$

$$-6$$

$$x = 1$$

$$1^2 + 1 - 6$$

$$2 - 6$$

$$-4$$

$$x = 2$$

$$(2)^2 + 2 - 6$$

$$4 + 2 - 6$$

$$6 - 6$$

$$0$$





## 4.5: Adding/ Subtracting Polynomials

How do you add and subtract polynomials?

**Simplify:**

Add

$$(6x^2 - 2x - 5) + (x^2 - 3x + 4)$$

**Solution:**

$$(6x^2 - 2x - 5) + (x^2 - 3x + 4)$$

Distribute the addition

$$6x^2 - 2x - 5 + x^2 + -3x + 4$$

Combine Like Terms

$$6x^2 + x^2 - 2x + -3x - 5 + 4$$

Simplified Solution :

$$7x^2 - 5x - 1$$

$$(6x^2 - 2x - 5) + 1(x^2 - 3x + 4)$$

$$\begin{array}{r} 6x^2 - 2x - 5 \\ + \quad 1x^2 - 3x + 4 \\ \hline \end{array}$$

$$6x^2 + 1x^2 \quad -2x + -3x \quad -5 + 4$$

$$\boxed{7x^2 \quad -5x \quad -1}$$

**Simplify:**

Subtract

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

**Solution:**

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

Distribute the subtraction

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

Combine Like Terms

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

Simplified Solution :

$$-3x^2 - 4x + 13$$

$$(3x^2 - 4x + 6) - 1(6x^2 - 7)$$

$$\begin{array}{r} 3x^2 - 4x + 6 \\ - \quad 6x^2 + 7 \\ \hline \end{array}$$

$$3x^2 - 6x^2 \quad -4x \quad +6 + 7$$

$$\boxed{-3x^2 \quad -4x \quad +13}$$

**Practice Problems:**

a.  $5x^2 - 3x + 4x^2 - 7x + 6$

$5x^2 + 4x^2 - 3x - 7x + 6$

$9x^2 - 10x + 6$

b.  $2xy - 7y + 3y - 2xy - 4xy^2$

$2xy - 2xy - 7y + 3y - 4xy^2$

$-4y - 4xy^2$   
 $-4xy^2 - 4y$

c.  $(x^2 - 5x - 7) + (3x^2 + 4x - 5)$

$x^2 - 5x - 7 + 3x^2 + 4x - 5$

$x^2 + 3x^2 - 5x + 4x - 7 - 5$

$4x^2 - x - 12$

d.  $(-4x + 6) - (2x^2 - 6x^2 - 3)$

$-4x + 6 - 2x^2 + 6x^2 + 3$

$-2x^2 + 6x^2 - 4x + 9$

$4x^2 - 4x + 9$

e.  $3(-2x + 5) - 5(3x^2 - 4x - 1)$

$-6x + 15 - 15x^2 + 20x + 5$

$-6x + 20x$

$-15x^2 + 14x + 20$

f.  $1x(9x^2 - x + 5) - 2x(4x^2 + 3x - 6)$

$9x^3 - x^2 + 5x - 8x^3 - 6x^2 + 12x$

$9x^3 - 8x^3 - x^2 - 6x^2 + 5x + 12x$

$x^3 - 7x^2 + 17x$

How do you add and subtract polynomials?

Varies

## 4.5: Adding/ Subtracting Polynomials Practice Problems

Simplify:

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

$$\begin{array}{r} -2x^3 + 5x^3 - 7x^2 - 7x^2 - 3x + 3x + 4 + 9 \\ \checkmark \quad \quad \checkmark \quad \quad \checkmark \quad \quad \checkmark \\ 3x^3 - 14x^2 + 0x + 13 \end{array}$$

$$\boxed{3x^3 - 14x^2 + 13}$$

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

$$\begin{array}{r} a^2b - 4a^2b + 5ab - 7ab^2 - 8ab^2 + 3a \\ \checkmark \quad \quad \checkmark \\ -3a^2b + 5ab - 15ab^2 + 3a \end{array}$$

3.  $(x^2 - 5) + (-6x^2 + 2x - 5)$

$$x^2 - 5 + -6x^2 + 2x + -5$$

$$\begin{array}{r} x^2 - 6x^2 + 2x - 5 + -5 \\ \checkmark \quad \quad \checkmark \\ -5x^2 + 2x - 10 \end{array}$$

$$\boxed{-5x^2 + 2x - 10}$$

4.  $(-a^2 + 9a - 1) + (a^2 + 9a - 8)$

$$-a^2 + 9a - 1 + a^2 + 9a - 8$$

$$\begin{array}{r} -a^2 + a^2 + 9a + 9a - 1 + -8 \\ \checkmark \quad \quad \checkmark \quad \quad \checkmark \\ 0a^2 + 18a - 9 \end{array}$$

$$\boxed{18a - 9}$$

5.  $(5x^2 - 3x + 2) - (2x^2 - 7x - 2)$

$$5x^2 - 3x + 2 - 2x^2 + 7x + 2$$

$$\begin{array}{r} 5x^2 - 2x^2 - 3x + 7x + 2 + 2 \\ \checkmark \quad \quad \checkmark \quad \quad \checkmark \\ 3x^2 + 4x + 4 \end{array}$$

$$\boxed{3x^2 + 4x + 4}$$

6.  $(-x^2 - 4x) - (x^2 + 6x - 2)$

$$-x^2 - 4x - x^2 - 6x + 2$$

$$\begin{array}{r} -x^2 - x^2 - 4x - 6x + 2 \\ \checkmark \quad \quad \checkmark \\ -2x^2 - 10x + 2 \end{array}$$

$$\boxed{-2x^2 - 10x + 2}$$

## 4.5: Adding/ Subtracting Polynomials Practice Problems Continue

Simplify:

$$\begin{aligned}
 7. \quad & (-8x+7) + (5x-3) + (-2x-7) \\
 & -8x+7 + 5x-3 + -2x + -7 \\
 & -8x + 5x - 2x + 7 + -3 + -7 \\
 & \boxed{-5x - 3}
 \end{aligned}$$

$$\begin{aligned}
 8. \quad & -3x^2 - (x-7) - (x^2+6x-1) \\
 & -3x^2 - x + 7 - x^2 - 6x + 1 \\
 & -3x^2 - 1x^2 - x - 6x + 7 + 1 \\
 & \boxed{-4x^2 - 7x + 8}
 \end{aligned}$$

$$\begin{aligned}
 9. \quad & (-2x+5) + (3x^2-4x-8) - (x^2+5x-3) \\
 & -2x+5 + 3x^2 + -4x + -8 - x^2 - 5x + 3 \\
 & 3x^2 - x^2 - 2x + -4x - 5x + 5 + -8 + 3 \\
 & 2x^2 - 11x + 0 \\
 & \boxed{2x^2 - 11x}
 \end{aligned}$$

$$\begin{aligned}
 10. \quad & 4x^2y + (6x^2y - 2xy^2) - (x^2y + 10xy^2) \\
 & 4x^2y + 6x^2y + -2xy^2 - x^2y - 10xy^2 \\
 & 4x^2y + 6x^2y - x^2y - 2xy^2 - 10xy^2 \\
 & \boxed{9x^2y - 12xy^2}
 \end{aligned}$$

$$\begin{aligned}
 11. \quad & (x^2+3) - x(x-2) \\
 & x^2+3 - x^2+2x \\
 & x^2 - x^2 + 2x + 3 \\
 & \boxed{2x+3}
 \end{aligned}$$

$$\begin{aligned}
 12. \quad & 3x(6x^2+2) - x(x^2+7x-5) \\
 & 18x^3 + 6x - x^3 - 7x^2 + 5x \\
 & 18x^3 - 1x^3 - 7x^2 + 6x + 5x \\
 & \boxed{17x^3 - 7x^2 + 11x}
 \end{aligned}$$



## 4.6: Multiplying Polynomials

How do you multiply polynomials?

Simplify:  $2x^4(3x^2 - 4x + 5)$

**Solution:**

Distributive Property

$$\begin{aligned} & 2x^4(3x^2 - 4x + 5) \\ & 2x^4(3x^2) + 2x^4(-4x) + 2x^4(5) \\ & 6x^6 - 8x^5 + 10x^4 \end{aligned}$$

**Practice Exercises:**

a.  $-3x^2(-x^4 + 3x^2 - 1)$

$$3x^6 - 9x^4 + 3x^2$$

b.  $-5x^3y(3x^2y^4 - 7x^2 + 4y^3 - 2)$

$$-15x^5y^5 + 35x^5y - 20x^3y^4 + 10x^3y$$

**Simplify:**  $(3x + 2)(5x - 9)$

**Solution:**

Method 1: FOIL

$$(3x + 2)(5x - 9)$$

Use FOIL (First, Outer, Inner, Last)

First :  $(3x)(5x) = 15x^2$

Outer :  $(3x)(-9) = -27x$

Inner :  $(2)(5x) = 10x$

Last :  $(2)(-9) = -18$

Combine Like Terms

$$15x^2 - 27x + 10x - 18$$

Simplified Solution :

$$15x^2 - 17x - 18$$

Method 2: Table Method

$$(3x + 2)(5x - 9)$$

	5x	-9
3x	$15x^2$	$-27x$
+2	$10x$	-18

Combine Like Terms

$$15x^2 - 27x + 10x - 18$$

Simplified Solution :

$$15x^2 - 17x - 18$$

$$\begin{array}{l} \overbrace{(3x+2)} \quad \overbrace{(5x-9)} \\ 15x^2 - 27x + 10x - 18 \\ \quad \quad \quad \downarrow \\ 15x^2 - 17x - 18 \end{array}$$

	5x	-9
3x	$15x^2$	$-27x$
+2	$10x$	-18

$$15x^2 - 17x - 18$$

Practice Problems:

$$(x-5)(-3x-8)$$

$$-3x^2 - 8x + 15x + 40$$

$$\boxed{-3x^2 + 7x + 40}$$

Optional Table Method

41	-3x	-8
x	-3x <sup>2</sup>	-8x
-5	+15x	+40

$$\boxed{-3x^2 + 7x + 40}$$

$$(4x+1)(x^2-6x-8)$$

$$4x^3 - 24x^2 - 32x + x^2 - 6x - 8$$

$$\boxed{4x^3 - 23x^2 - 38x - 8}$$

Optional Table Method

P	x <sup>2</sup>	-6x	-8
4x	4x <sup>3</sup>	-24x <sup>2</sup>	-32x
+1	+1x <sup>2</sup>	-6x	-8

$$4x^3 - 23x^2 - 38x - 8$$

$$(2x^2 - 4x + 1)(7x^2 - 3x - 4)$$

$$14x^4 - 6x^3 - 8x^2 - 28x^3 + 12x^2 + 16x + 7x^2 - 3x - 4$$

$$\boxed{14x^4 - 34x^3 + 11x^2 + 13x - 4}$$

Optional Table Method

P	2x <sup>2</sup>	-4x	+1
7x <sup>2</sup>	14x <sup>4</sup>	-28x <sup>3</sup>	+7x <sup>2</sup>
-3x	-6x <sup>3</sup>	+12x <sup>2</sup>	-3x
-4	-8x <sup>2</sup>	+16x	-4

## Special Products

**Examples:**

Simplify:

$$(x+3)^2 = \cancel{x^2 + 9}$$

$$(x+3)(x+3)$$

$$x^2 + 3x + 3x + 9$$

$$\boxed{x^2 + 6x + 9}$$

Optional Table Method

1	x	+3
x	x <sup>2</sup>	+3x
+3	+3x	+9

$$x^2 + 6x + 9$$

Simplify:

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

$$(2x-5)(2x-5)$$

$$4x^2 - 10x - 10x + 25$$

$$4x^2 - 20x + 25$$

Optional Table Method

1	2x	-5
2x	4x <sup>2</sup>	-10x
-5	-10x	+25

$$4x^2 - 20x + 25$$



Simplify:

$$(x+3)(x-3)$$

$$x^2 - 3x + 3x - 9$$

$$x^2 - 9$$

Optional Table Method

$\downarrow$	$x$	$-3$
$x$	$x^2$	<del><math>-3x</math></del>
$+3$	<del><math>+3x</math></del>	$-9$

$$x^2 - 9$$

Simplify:

$$(4x-1)(4x+1)$$

$$16x^2 + 4x - 4x - 1$$

$$16x^2 - 1$$

Optional Table Method

$\downarrow$	$4x$	$+1$
$4x$	$16x^2$	<del><math>+4x</math></del>
$-1$	<del><math>-4x</math></del>	<del><math>+1</math></del>

$$16x^2 - 1$$

How do you multiply polynomials?

Varies

---

---

## 4.6: Multiplying Polynomials Practice Problems

Simplify:

1.  $-x^3(-3x^5 + 15x^3 - 9x - 2)$

$$\boxed{3x^8 - 15x^6 + 9x^4 + 2x^3}$$

2.  $-3a^2b^4(a^3b^3 - 2a^5b + 4a^5b^2c^3 - 1)$

$$\boxed{-3a^5b^7 + 6a^7b^5 - 12a^7b^6c^3 + 3a^2b^4}$$

3.  $(x+5)(x+3)$

$$x^2 + 3x + 5x + 15$$

$$\boxed{x^2 + 8x + 15}$$

4.  $(x-7)(x+9)$

$$x^2 + 9x - 7x - 63$$

$$\boxed{x^2 + 2x - 63}$$

5.  $(2x+7)(x-6)$

$$2x^2 - 12x + 7x - 42$$

$$\boxed{2x^2 - 5x - 42}$$

6.  $(4x-5)(3x-2)$

$$12x^2 - 8x - 15x - 10$$

$$\boxed{12x^2 - 23x - 10}$$

7.  $(-3x+4)(2x+1)$

$$-6x^2 - 3x + 8x + 4$$

$$\boxed{-6x^2 + 5x + 4}$$

8.  $-(x+3)(2x-9)$

$$(-x-3)(2x-9)$$

$$-2x^2 + 9x - 6x + 27$$

$$\boxed{-2x^2 + 3x + 27}$$

## 4.6: Multiplying Polynomials Practice Problems Continue

Simplify:

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

$$x^3 - 3x^2 + 4x + 2x^2 - 6x + 8$$

$$x^3 - 3x^2 + 2x^2 + 4x - 6x + 8$$

$$\boxed{x^3 - x^2 - 2x + 8}$$

10.  $(3x-2)(2x^2-5x-7)$

$$6x^3 - 15x^2 - 21x - 4x^2 + 10x + 14$$

$$6x^3 - 15x^2 - 4x^2 - 21x + 10x + 14$$

$$\boxed{6x^3 - 19x^2 - 11x + 14}$$

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

$$x^4 - 3x^3 + 2x^2 + 2x^3 - 6x^2 + 4x + 1x^2 - 3x + 2$$

$$x^4 - 3x^3 + 2x^3 + 2x^2 - 6x^2 + 1x^2 + 4x - 3x + 2$$

$$\boxed{x^4 - x^3 - 3x^2 + x + 2}$$

12.  $(2x^2-3x-4)(3x^2-5x+1)$

$$6x^4 - 10x^3 + 2x^2 - 9x^3 + 15x^2 - 3x - 12x^2 + 20x - 4$$

$$6x^4 - 10x^3 - 9x^3 + 2x^2 + 15x^2 - 12x^2 - 3x + 20x - 4$$

$$\boxed{6x^4 - 19x^3 + 5x^2 + 17x - 4}$$

13.  $(x+4)^2$

$$(x+4)(x+4)$$

$$x^2 + 4x + 4x + 16$$

$$\boxed{x^2 + 8x + 16}$$

14.  $(3x-7)^2$

$$(3x-7)(3x-7)$$

$$9x^2 - 21x - 21x + 49$$

$$\boxed{9x^2 - 42x + 49}$$

15.  $(x+5)(x-5)$

$$x^2 - 5x + 5x - 25$$

$$\boxed{x^2 - 25}$$

16.  $(5x-6)(5x+6)$

$$25x^2 + 30x - 30x - 36$$

$$\boxed{25x^2 - 36}$$



## 4.7: Division of Polynomials (Monomials)

How do you divide polynomials (monomials)?

**Example:**

Simplify

$$\frac{30x^4y^3}{15x^2y^7}$$

**Solution:**

$$\frac{30x^4y^3}{15x^2y^7}$$

$$\frac{2 \cdot 3 \cdot 5xxxxyyy}{3 \cdot 5xxxxyyy}$$

$$\frac{2 \cdot 3 \cdot \cancel{5}xxxxyyy}{3 \cdot \cancel{5}xxxxyyy}$$

$$\frac{2x^2}{y^4}$$

**Practice Examples:**

a.  $\frac{6x^5y^2z^2}{20x^5yz^{10}}$

$$\frac{3y}{10z^8}$$

b.  $\frac{-3ab^5d^0}{9a^6b^2c^3}$

$$\frac{-1b^3}{3a^5c^3}$$

$$\frac{b^3}{-3a^5c^3}$$

**Example:**

Simplify

$$\frac{10x^2 - 8x + 4}{2x}$$

**Solution:**

$$\frac{10x^2 - 8x + 4}{2x}$$

$$\frac{10x^2}{2x} - \frac{8x}{2x} + \frac{4}{2x}$$

$$5x - 4 + \frac{2}{x}$$

**Practice Examples:**

a.  $\frac{12x^4 - 3x}{6x^3}$

$$\frac{12x^4}{6x^3} - \frac{3x}{6x^3}$$

$$\boxed{2x - \frac{1}{2x^2}}$$

b.  $\frac{20x^3y^3 - 7xy^5 + 35x^6}{5x^2y^3}$

$$\frac{20x^3y^3}{5x^2y^3} - \frac{7xy^5}{5x^2y^3} + \frac{35x^6}{5x^2y^3}$$

$$\boxed{4x - \frac{7y^2}{5x} + \frac{7x^4}{y^3}}$$

How do you divide polynomials (monomials)?

Varies

---

---

## 4.7: Division of Polynomials (Monomials) Practice Problems

Simplify:

$$1. \quad \frac{30a^3b^5}{5a^4b^5} = \frac{6}{a}$$

$$2. \quad \frac{-12x^{12}y^8z^0}{-24x^{16}y^{10}z^5}$$

$$\frac{1}{2x^4y^2z^5}$$

$$3. \quad \frac{20x-25}{5}$$

$$\frac{20x}{5} - \frac{25}{5}$$

$$\boxed{4x-5}$$

$$4. \quad \frac{14x^2-21x}{7x}$$

$$\frac{14x^2}{7x} - \frac{21x}{7x}$$

$$\boxed{2x-3}$$

$$5. \quad \frac{x^5-6x}{3x^3}$$

$$\frac{x^5}{3x^3} - \frac{6x}{3x^3}$$

$$\boxed{\frac{x^2}{3} - \frac{2}{x^2}}$$

$$6. \quad \frac{9b^5-3b^4+18}{9b^2}$$

$$\frac{9b^5}{9b^2} - \frac{3b^4}{9b^2} + \frac{18}{9b^2}$$

$$\boxed{b^3 - \frac{b^2}{3} + \frac{2}{b^2}}$$

$$7. \quad \frac{6a^2b^7-3a^7b^{10}+5a^2b^0}{3a^5b^3}$$

$$\frac{6a^2b^7}{3a^5b^3} - \frac{3a^7b^{10}}{3a^5b^3} + \frac{5a^2b^0}{3a^5b^3}$$

$$\boxed{\frac{2b^4}{a^3} - a^2b^7 + \frac{5}{3a^3b^3}}$$

$$8. \quad \frac{12x^6y-15x^5y^5+2x^4}{6x^4y}$$

$$\frac{12x^6y}{6x^4y} - \frac{15x^5y^5}{6x^4y} + \frac{2x^4}{6x^4y}$$

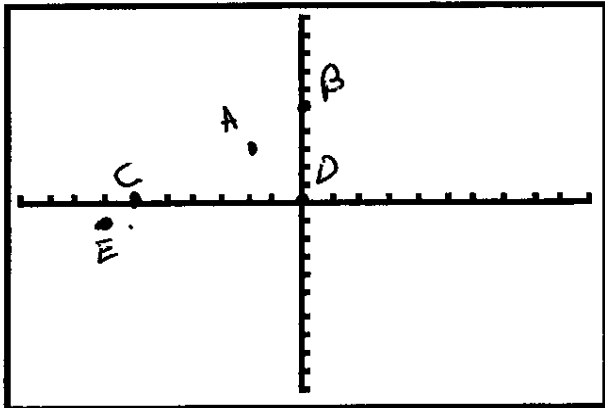
$$\boxed{2x^2 - \frac{5xy^4}{2} + \frac{1}{3y}}$$

Test 2 (Chapter 3 / 4) REVIEW

Questions from Chapter 3

1. Plot the following points and label

- A (-2, 3)
- B (0, 5)
- C (-6, 0)
- D (0, 0)
- E (-7, -1)



2. Is (-2, 5) a solution to:

$$-x + y = 3$$

$$-(-2) + 5 = 3$$

$$2 + 5 = 3$$

$$7 = 3$$

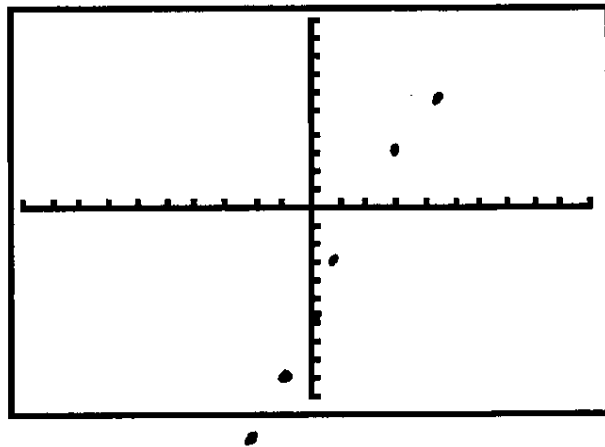
No

3. Complete the table for the equation:

$$3x - y = 6$$

x	y	(x, y)
-2	-12	(-2, -12)
-1	-9	(-1, -9)
0	-6	(0, -6)
4	6	(4, 6)
1	-3	(1, -3)
3	3	(3, 3)

4. Plot the points in #3



$x = -1$

$$3(-1) - y = 6$$

$$-3 - y = 6$$

$$\begin{array}{r} -3 - y = 6 \\ +3 \quad +3 \\ \hline -y = 9 \\ \hline -1 \quad -1 \\ \hline y = -9 \end{array}$$

$y = -3$

$$3x - (-3) = 6$$

$$3x + 3 = 6$$

$$\begin{array}{r} 3x + 3 = 6 \\ -3 \quad -3 \\ \hline 3x = 3 \\ \hline \frac{3x}{3} = \frac{3}{3} \\ \hline x = 1 \end{array}$$

$x = -2$

$$3(-2) - y = 6$$

$$-6 - y = 6$$

$$\begin{array}{r} -6 - y = 6 \\ +6 \quad +6 \\ \hline -y = 12 \\ \hline -1 \quad -1 \\ \hline y = -12 \end{array}$$

$y = -12$

$x = 0$

$$3(0) - y = 6$$

$$0 - y = 6$$

$$\begin{array}{r} 0 - y = 6 \\ -1 \quad -1 \\ \hline -y = 6 \\ \hline -1 \quad -1 \\ \hline y = -6 \end{array}$$

$y = 6$

$$3x - 6 = 6$$

$$\begin{array}{r} 3x - 6 = 6 \\ +6 \quad +6 \\ \hline 3x = 12 \\ \hline \frac{3x}{3} = \frac{12}{3} \\ \hline x = 4 \end{array}$$

$y = 3$

$$3x - 3 = 6$$

$$\begin{array}{r} 3x - 3 = 6 \\ +3 \quad +3 \\ \hline 3x = 9 \\ \hline \frac{3x}{3} = \frac{9}{3} \\ \hline x = 3 \end{array}$$

5. Find the x-intercept of:  $y = -3x + 6$

$$\begin{array}{r|l} x & y \\ \hline 2 & 0 \end{array} \quad \begin{array}{l} 0 = -3x + 6 \\ \underline{-6} \qquad \underline{-6} \\ -6 = -3x \\ \underline{-3} \quad \underline{-3} \\ x = 2 \end{array}$$

$(2, 0)$

6. Find the y-intercept of:  $2x - 3y = 12$

$$\begin{array}{r|l} x & y \\ \hline 0 & -4 \end{array} \quad \begin{array}{l} 2(0) - 3y = 12 \\ -3y = 12 \\ \underline{-3} \quad \underline{-3} \\ y = -4 \end{array}$$

$(0, -4)$

7. Find the slope of:  $(-3, 2)$  and  $(-5, -4)$

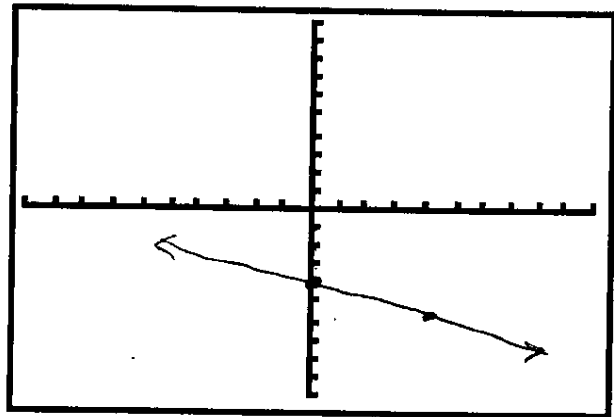
$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \begin{array}{cc} x_1 & y_1 \\ x_2 & y_2 \end{array}$$

$$m = \frac{-4 - 2}{-5 - (-3)} = \frac{-6}{-2} = 3$$

$-5 + 3$

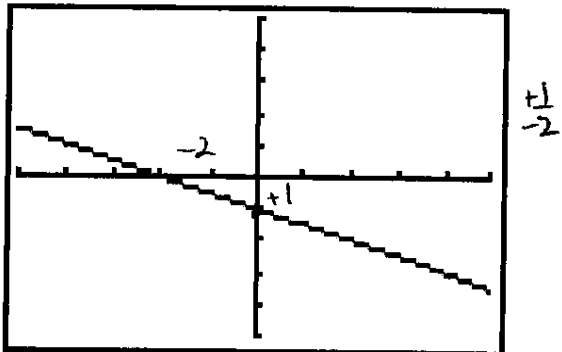
8. Graph:  $y = -\frac{2}{5}x - 4$

$$m = \frac{-2}{5} \quad b = -4$$



9. What is the equation of the line for:

$$y = -\frac{1}{2}x + -1$$

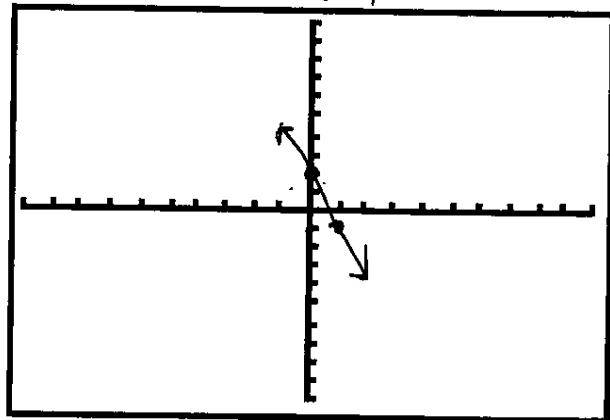


or

$$y = -\frac{1}{2}x - 1$$

10. Graph:  $y = -3x + 2$

$$m = -3 \quad b = 2$$





Questions from Chapter 4

11. Simplify:  $x^5 y^3 x^6 y$

$$\boxed{x^{11} y^4}$$

12. Simplify:  $\frac{10x^5 y^7 z^2}{2x^8 yz^0}$

$$\boxed{\frac{5y^6 z^2}{x^3}}$$

13. Simplify:  $(2x^2 y^6)^4 x^3 y^7$

$$16x^8 y^{24} x^3 y^7$$

$$\boxed{16x^{11} y^{31}}$$

14. Simplify:  $\frac{x^{-3} y^5 z^{-2}}{x^0 y^{-1} z^4}$

$$\frac{y^5 y}{x^3 z^2 z^4}$$

$$\boxed{\frac{y^6}{x^3 z^6}}$$

15. Simplify:  $(x^3 y^0)^{-5}$

$$\rightarrow \begin{array}{l} x^{-15} \\ \frac{1}{x^{15}} \end{array} \quad \left| \quad \begin{array}{l} \left(\frac{1}{x^3 y^0}\right)^5 \\ \frac{1}{x^{15}} \end{array}$$

16. Simplify:  $\left(\frac{3x^{-3} y^{-2} z^7 w^0}{9y^{-5} z^{-6}}\right)^{-2}$

$$\left(\frac{1z^7 y^5 z^6}{3x^3 y^2}\right)^{-2}$$

$$\left(\frac{y^3 z^{13}}{3x^3}\right)^{-2}$$

$$\left(\frac{3x^3}{y^3 z^{13}}\right)^2$$

$$\boxed{\frac{9x^6}{y^6 z^{26}}}$$

17. Simplify:  $(5x^2 - 3x + 4) - (-2x^2 + 6x - 5)$

$$5x^2 - 3x + 4 + 2x^2 - 6x + 5$$

$$5x^2 + 2x^2 - 3x - 6x + 4 + 5$$

$$\boxed{7x^2 - 9x + 9}$$

18. Simplify:  $-3x^2(2x^4 - 5x^3)$

$$-6x^6 + 15x^5$$

$$\boxed{-6x^6 + 15x^5}$$

19. Simplify:  $(2x - 3)(-x + 8)$

$$-2x^2 + 16x + 3x - 24$$

$$\boxed{-2x^2 + 19x - 24}$$

20. Simplify:  $(4x - 5)^2$

$$(4x - 5)(4x - 5)$$

$$16x^2 - 20x - 20x + 25$$

$$\boxed{16x^2 - 40x + 25}$$

21. Convert to scientific notation:  
1,530,000

$$1.53 \times 10^6$$

22. Convert to standard notation:  
 $-2.5 \times 10^{-3}$

~~\_\_\_\_\_~~

$$-0.0025$$

**Review Questions on the State Exam**

23. Simplify:  $-2[7(3x - 4) + 5x]$

$$-2[21x - 28 + 5x]$$

$$-2[26x - 28]$$

$$\boxed{-52x + 56}$$

24. Evaluate when  $w = -1$ :  $-2w^2 + 4w - 6$

$$-2(-1)^2 + 4(-1) - 6$$

$$-2(1) - 4 - 6$$

$$-2 - 4 - 6$$

$$-6 - 6$$

$$\boxed{-12}$$

25. Solve for r:  $-4(-5x+2) = 2(2x+20)$

$$\begin{array}{r} 20x - 8 = 4x + 40 \\ -4x \quad -4x \\ \hline 16x - 8 = 40 \end{array}$$

$$16x - 8 = 40$$

$$\begin{array}{r} +8 \quad +8 \\ \hline 16x = 48 \end{array}$$

$$\begin{array}{r} 16x = 48 \\ \hline 16 \quad 16 \end{array}$$

$$\boxed{x = 3}$$

26. Solve for y:  $\left[ \frac{2}{3}y - \frac{3}{4} = 2 \right]$

$$\frac{4}{1} \cdot \frac{2}{3}y - \frac{3}{1} \cdot \frac{3}{4} = 12 \cdot 2$$

$$8y - 9 = 24$$

$$\begin{array}{r} +9 \quad +9 \\ \hline 8y = \frac{33}{8} \end{array}$$

$$\boxed{y = \frac{33}{8}}$$

27. Solve for b:  $c = 4a + 2b$

$$c = 4a + 2b$$

$$\begin{array}{r} -4a \quad -4a \\ \hline c - 4a = 2b \end{array}$$

$$\frac{c - 4a}{2} = \frac{2b}{2}$$

$$b = \frac{c - 4a}{2} = \frac{1}{2}c - 2a$$

28. If a digital player costs \$425 after a 15% discount, what was the original cost?

$$x - .15x = 425$$

$$\begin{array}{r} .85x = 425 \\ \hline .85 \quad .85 \end{array}$$

$$\boxed{x = 500}$$

$$.85 \overline{)425}$$

$$\begin{array}{r} 500 \\ 85 \overline{)42500} \\ -425 \phantom{00} \\ \hline 000 \end{array}$$

29. If 8 less than the square of a number, then the result is the product of 6 and a number. Choose the equation that could be used to find this number, x. DO NOT SOLVE THE PROBLEM, JUST SET UP THE EQUATION.

$$x^2 - 8 = 6x$$

30. Write a proportion that solves the problem: A hybrid can travel 1100 miles on 55 gallons of gasoline. How many gallons of gas are needed to travel 1925 miles? DO NOT SOLVE THE PROBLEM, JUST SET UP THE PROPORTION.

miles  
gallons

$$\boxed{\frac{1100}{55} = \frac{1925}{x}}$$