

Slope-intercept form of linear equations**Writing Linear Equations**

Linear equations are equations of lines. A linear equation written in slope-intercept form is $y = mx + b$, where m is the slope of the line and b is the y -intercept. The y -intercept is the point at which the line crosses the y -axis.

$$y = 3x + 2$$

$$m = 3, y\text{-int.} = 2$$

$$y = -5x + 1$$

$$m = -5, y\text{-int.} = 1$$

$$y = x - 7$$

$$m = 1, y\text{-int.} = -7$$

$$y = -8x - 10$$

$$m = -8, y\text{-int.} = -10$$

Equations written in standard form can be put in slope-intercept form simply by adding or subtracting terms from either side of the equations.

$$3x + y = 12$$

$$3x - 3x + y = 12 - 3x$$

$$y = -3x + 12$$

$$-7x - y = 4$$

$$-7x + 7x - y = 4 + 7x$$

$$-y = 7x + 4$$

$$(-1)y = (-1)(7x + 4)$$

$$y = -7x - 4$$

$$6x - 2y = 10$$

$$6x - 6x - 2y = 10 - 6x$$

$$\frac{-2y}{-2} = \frac{10}{-2} - \frac{6x}{-2}$$

$$y = -5 + 3x$$

$$y = 3x - 5$$

1. Write the slope-intercept form of the equation of a line.

State the slope and the y -intercept of each line.

2. $y = 2x + 5$

3. $y = x - 10$

4. $y = -x + 4$

5. $y = -3x + 7$

6. $y = -5x$

7. $y = 5$

Put each equation in slope-intercept form.

8. $3x + y = 10$

9. $7x - y = -12$

10. $-7x - y = -5$

11. $-3y = 12 + 3x$

12. $4y = 4x + 8$

13. $x + 2y = 16$

14. $-2x + 8y = -8$

15. $-12y = 24x + 12$

Example: Graph $y = 3x - 2$.

Step 1: Find three possible solutions to the equation.

Step 2: Make a chart of the possible solutions.

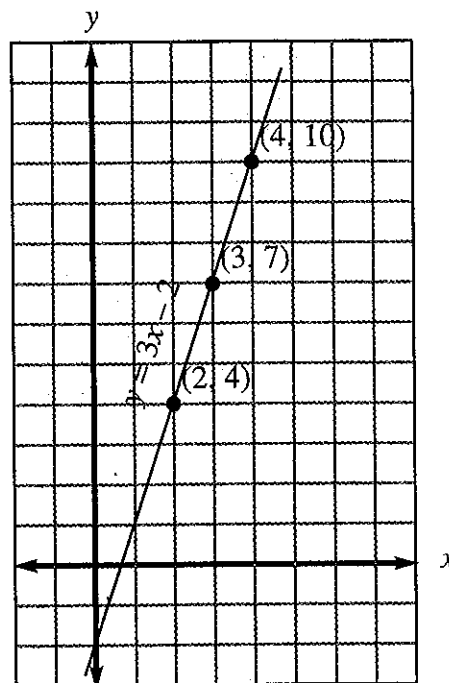
$$\begin{aligned} \text{If } x = 2, y &= 3(2) - 2 \\ y &= 6 - 2 \\ y &= 4 \end{aligned}$$

$$\begin{aligned} \text{If } x = 3, y &= 3(3) - 2 \\ y &= 9 - 2 \\ y &= 7 \end{aligned}$$

$$\begin{aligned} \text{If } x = 4, y &= 3(4) - 2 \\ y &= 12 - 2 \\ y &= 10 \end{aligned}$$

x	y
2	4
3	7
4	10

Step 3: Plot these points on a graph: (2, 4), (3, 7), (4, 10). Draw a line that connects the three points. (You can move both axes off center to gain more number places on them; see below.)



Example: $y = 2x - 3$

Step 1: Find three possible solutions to the equation.

$$\text{If } x = 5, \text{ then } y = 7 \text{ since } 2(5) - 3 = 7.$$

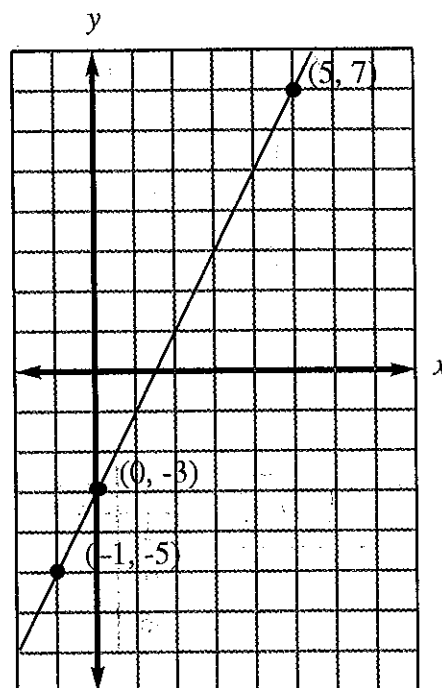
$$\text{If } x = 0, \text{ then } y = -3 \text{ since } 2(0) - 3 = -3.$$

$$\text{If } x = -1, \text{ then } y = -5 \text{ since } 2(-1) - 3 = -5.$$

Step 2: Make a chart of possible solutions.

x	y
5	7
0	-3
-1	-5

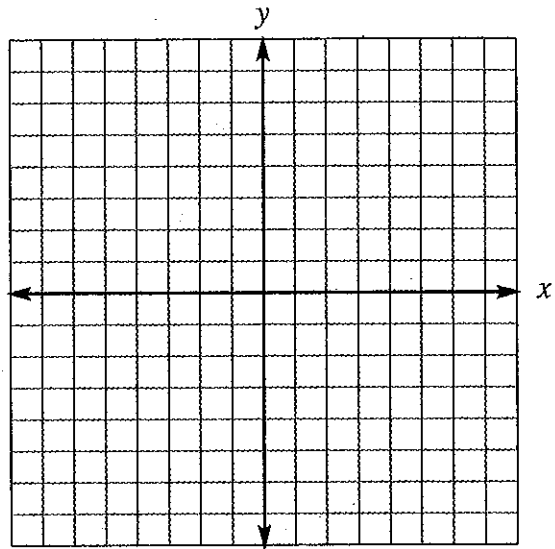
Step 3: Plot these points on a graph: (5, 7), (0, -3), (-1, -5). Draw a line connecting the points.



Directions: Graph the possible solutions for the equations.

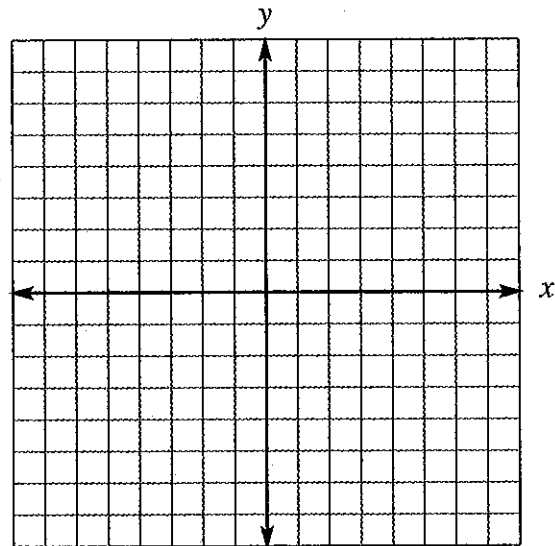
1. $y = 2x - 8$

x	y
2	
4	
6	



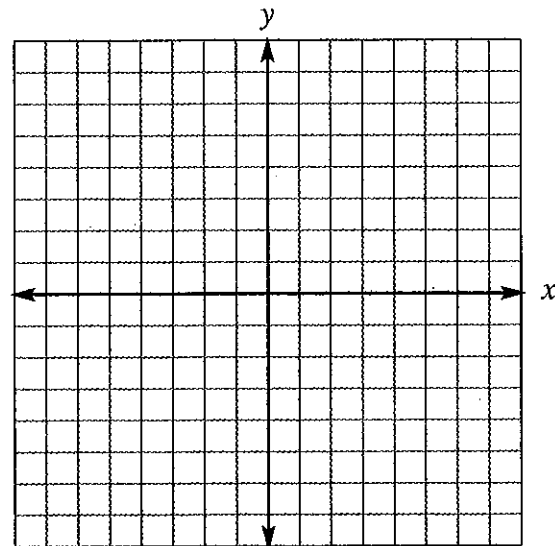
2. $y = x - 3$

x	y
-2	
5	
0	



3. $y = \frac{1}{2}x + 1$

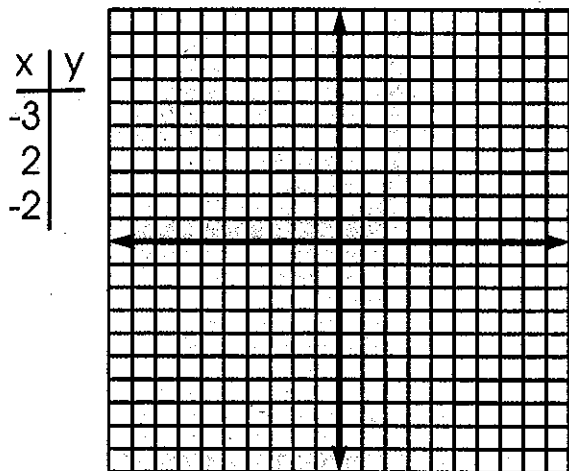
x	y
2	
6	
-6	



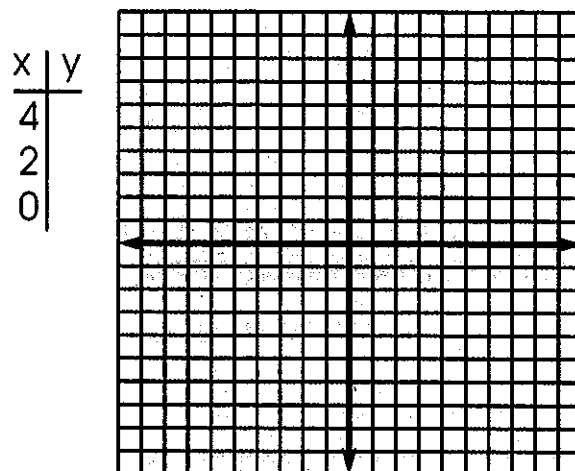
Graphing Linear Equations

Graph each equation by plotting points.

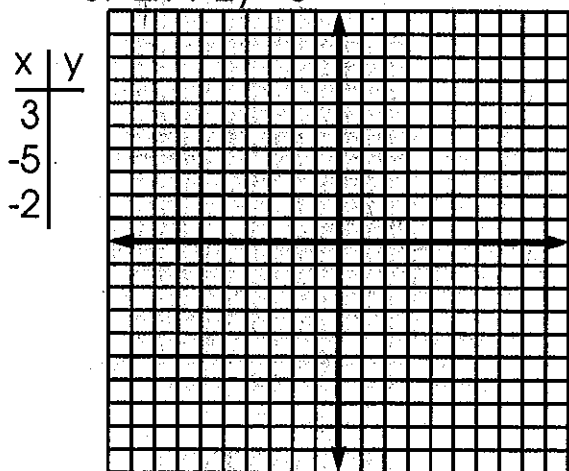
1. $y = x + 2$



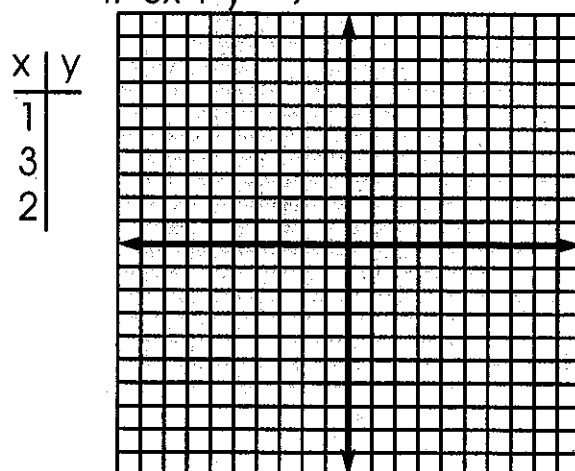
2. $y = 4x - 9$



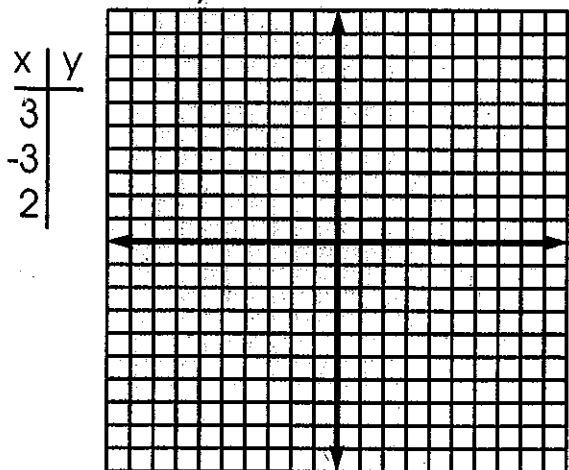
3. $2x + 2y = 8$



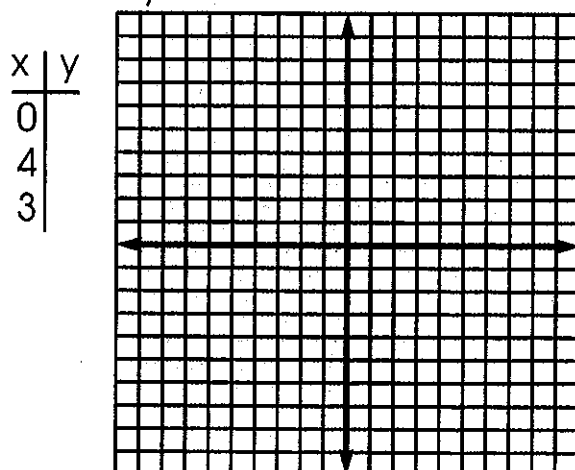
4. $3x + y = 9$



5. $x + y = 6$



6. $y = 9 - x$

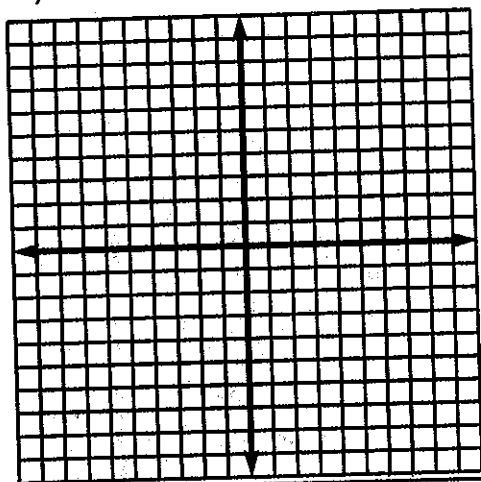


Graphing Linear Equations

Graph each equation by plotting points.

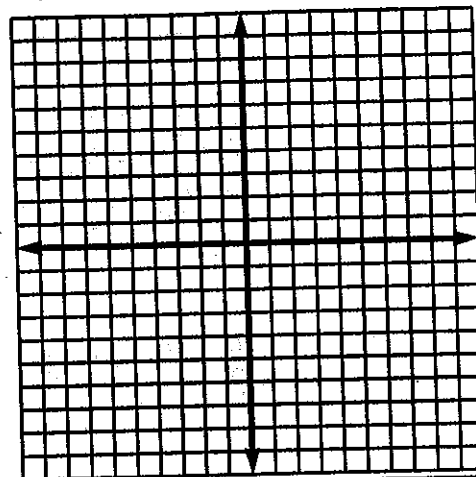
1. $y = x + 4$

x	y
2	
0	
-3	



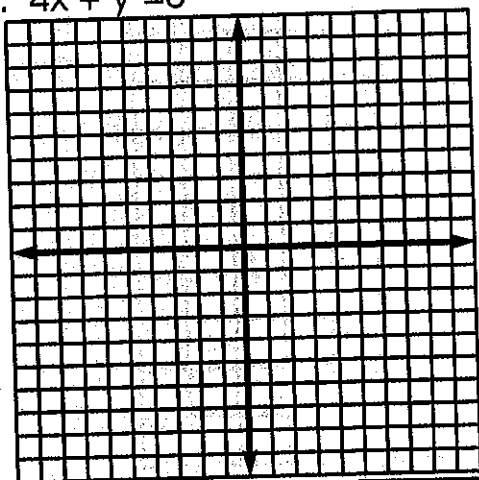
2. $y = 2x - 7$

x	y
3	
4	
1	



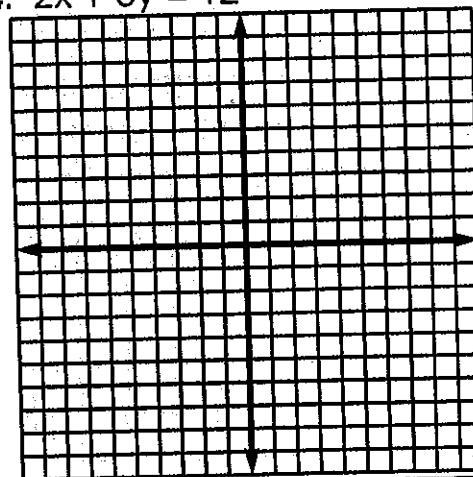
3. $4x + y = 8$

x	y
0	
1	
2	



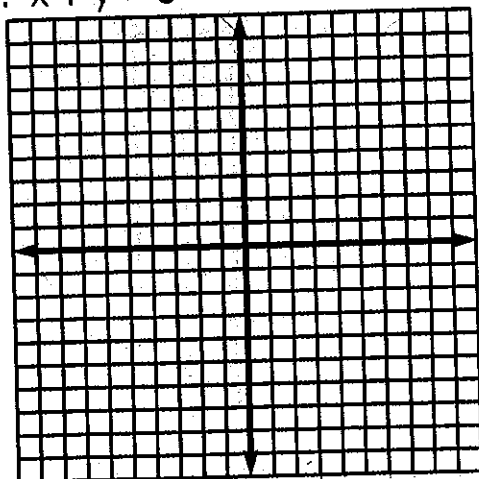
4. $2x + 6y = 12$

x	y
3	
0	
-3	



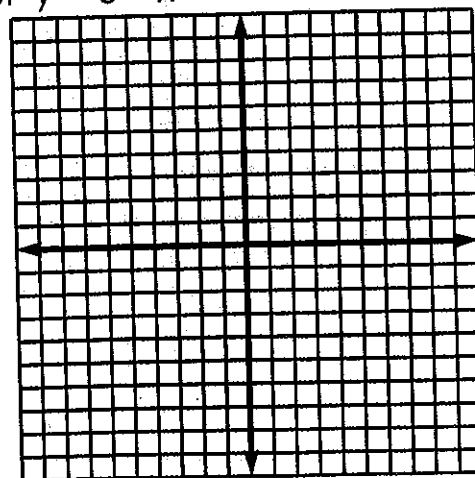
5. $x + y = 5$

x	y
4	
5	
6	



6. $y = 6 - x$

x	y
5	
-2	
0	



Raising Exponents to a Power

RULE: $(x^a)^b = x^{ab}$ $(x^2y^3)^3 = x^6y^9$

Multiply the following polynomials.

1. $(xy^3)(x^3y)$

11. $(-2x^2y^3)^2$

2. $(7xy^3)(-5x^3y^2)$

12. $(5x^2y^4)^3$

3. $(x^3y^3)^3$

13. $(-6x^4y^6)^3$

4. $(-4x^3y^3)^4$

14. $(7xy)^2$

5. $(6x^5y^4)^3$

15. $(-3x^3y)^3$

6. $(x^2y^3)(x^3y^2)$

16. $(-2x^2y)^3$

7. $(-9xy^3)^3$

17. $(4x^2y^3)^4$

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

18. $(2x)^5$

9. $(x^3y)^2$

19. $(6x^2y^3)^0$

10. $(3xy^3)^2(-4x^2y^4)^2(2xy^3)$

20. $(-3x^2y)^4$

Multiplying Exponents

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

Example: $a^4 \cdot a^3 = a^7$

Multiply the following polynomials.

1. $a \cdot a^2 \cdot a^3 =$

2. $(2a^2b)(4ab^2) =$

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

4. $b^3 \cdot b^4 \cdot b^7 \cdot b =$

5. $(3x^3)(3x^4)(-3x^2) =$

6. $(4c^2)(-8c^7) =$

7. $(5xy)(2x^2y^3) =$

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

9. $(-2c^4)(6cd)(-cd^2) =$

10. $(6k^2)(-3k)(2k^5) =$

11. $(m^2n)(mn^3)(mn) =$

12. $(-4p^3)(-3p^6)(-2p^9) =$

13. $(12e^3)(2g^3)(4eh) =$

14. $(5f)(-3f^3)(2f) =$

15. $(c^2h)(ch^3)(c^3h^4) =$

16. $(3c^2d^2)(-5cd^4) =$

17. $(5x^2y^3)(x^3y)(-x^2y^2) =$

18. $(-4m^3)(-4m^3) =$

19. $d \cdot d^2 \cdot d^3 \cdot d^4 \cdot d^5 =$

20. $(-1)(x)(-x^2)(x)(-x^2) =$

Dividing Exponents

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

Example: $\frac{x^6}{x^4} = x^{6-4} = x^2$

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

Divide the following polynomials.

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

11. $\frac{18c^3}{-3c^2}$

2. $\frac{9a^3b^5}{-3ab^2}$

12. $\frac{-48c^2d^4}{-8cd}$

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

13. $\frac{22y^5z^8}{2yz^7}$

4. $\frac{b^{14}c^9}{b^5c^4}$

14. $\frac{28x^2y}{-4x^2}$

5. $\frac{-12m^5}{6m}$

15. $\frac{-3p^8}{6p^2}$

6. $\frac{15k^7r^3}{-3k^5}$

16. $\frac{42r^{13}}{-7r^8}$

7. $\frac{9a^{13}}{a^3}$

17. $\frac{(6x^3)(4x^9)}{-12x^{10}}$

8. $\frac{(3xy)(4x^2y)}{-6xy^2}$

18. $\frac{21k^9}{(3k)(7k^4)}$

9. $\frac{-14c^{15}d^3}{-2c^9d}$

19. $\frac{4x^2y^3z^4}{2xy^2z^3}$

10. $\frac{(5k)(-8k^5)}{10k^3}$

20. $\frac{(121c^3)(-c^8)}{11c^5}$

Dividing Monomials

$$\frac{25x^9y^6}{5x^7y^8} = \frac{25}{5} \cdot x^{9-7} y^{6-8} = \frac{5x^2}{y^2}$$

Simplify.

1. $\frac{x^3}{x^5}$

2. $\frac{a^4b^2}{2a^2}$

3. $\frac{12x^2y^4}{3x^2y^3}$

4. $\frac{10a^6b^8}{40a^2b^2}$

5. $\frac{14c^2d^2}{28cd}$

6. $\frac{18a^9b^3}{36a^2b^2}$

7. $\frac{13m^6n^7}{26m^2n^5}$

8. $\frac{35x^9y^{10}z^5}{15x^9y^8z^3}$

9. $\frac{5x^3y^2z^2}{5x^2yz}$

10. $\frac{72x^5y^5z^6}{9x^4yz^3}$

11. $\frac{6x^6y^3z^4}{12x^3y^2z^3}$

12. $\frac{9x^8y^7z^8}{27x^5y^5z^4}$

13. $\frac{18a^6b^2c^6}{36a^4bc^2}$

14. $\frac{33x^7y^2}{11x^7yz}$

Name _____

Polynomials

Negative Exponents

Rule: $x^{-a} = \frac{1}{x^a}$

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

$8x^{-2} = \frac{8}{x^2}$

$(4x)^{-3} = \frac{1}{64x^3}$

Simplify the following.

1. a^{-6}

11. $7x^{-3}$

2. 2^{-4}

12. m^2n^{-2}

3. b^{-5}

13. $3a^2b^{-3}$

4. $\left(\frac{2}{3}\right)^{-1}$

14. $-2x^{-3}$

5. c^{-7}

15. $(-11x^3y)^{-2}$

6. $(xy)^{-1}$

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

7. $\left(\frac{3}{4}\right)^{-2}$

17. $5cd^{-9}$

8. $(2x)^{-3}$

18. $(-3x^3)^{-2}$

9. $(c^2d)^{-2}$

19. $12x^{-8}y$

10. $(6y^2)^{-2}$

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

Products of Polynomials

$$2y(y - 5) = 2y^2 - 10y$$

Use the distributive property to multiply these polynomials.

1. $3x(x - 3)$

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

2. $2xy(2x - 3y)$

12. $5b(4b^3 - 6b^2 - 6)$

3. $4a(2a + 4)$

13. $x(x^2 + x + x)$

4. $-5y^2(7y - 8y^2)$

14. $(3x^4 - 5x^2 - 4)(-3x^3)$

5. $-5ab(6a - 4b)$

15. $3y(y^2 - 3y + 2)$

6. $a(x + 1)$

16. $-4x^2(5 - 3x + 3x^2 + 4x^3)$

7. $y(y - 4)$

17. $3b(4b^3 - 12b^2 - 7)$

8. $5b(3 - b)$

18. $-4x^2(3x^3 + 8x^2 + -9x)$

9. $4x(x - 3)$

19. $(-9x^3)(3x^2 - 1)$

10. $4x^2(3x^2 - x)$

20. $(3x^2 - 6x)(-x)$

Products of Polynomials

$$(x - 2)(x^2 - x + 4) = x(x^2 - x + 4) - 2(x^2 - x + 4) = x^3 - x^2 + 4x - 2x^2 + 2x - 8 \\ = x^3 - 3x^2 + 6x - 8$$

Use the distributive property to multiply these polynomials.

1. $(5x + 3)(x + 6)$

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

2. $(4x + y)(3x - 2y)$

12. $5b(4b^3 - 6b^2 - 6)$

3. $(4a + 1)(4a + 1)$

13. $x^2(x^3 + x^2 + x)$

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

14. $(3x^4 - 5x^2 - 4)(-3x^3)$

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

15. $(x - y)(x^2 + y^2)$

6. $(x + 1)(1 + x)$

16. $(4x + 3)(2x - 4)$

7. $(2b - 8)(3b - 7)$

17. $(3b - 2)(3b^3 + 6b^2 + 2)$

8. $(3x + y)(x^2 + 3x + 4y)$

18. $(3x - 3)(x - 9)$

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

19. $(-2x^3 + 4)(2x^2 + 5)$

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

20. $(x - 7)(x + 6)$

Multiplying Binomials

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

Example: $(x - 2)(x + 2) = x^2 + 2x - 2x - 4 = x^2 - 4$

Use the FOIL method or DOTS rule to multiply the following binomials.

1. $(b - 7)(b + 7)$

11. $(8x^2 - 12)(8x^2 + 12)$

2. $(5x + y)(5x - y)$

12. $(2b^2 - 2)(2b^2 + 2)$

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

13. $(3x + 2)(3x - 2)$

4. $(x + 3)(x - 3)$

14. $(12 + b)(12 - b)$

5. $(c + d)(c - d)$

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

6. $(x + 1)(x - 1)$

16. $(x - yz)(x + yz)$

7. $(3b + 7)(3b - 7)$

17. $(12b - 4)(12b + 4)$

8. $(3x + y)(3x - y)$

18. $(7x - 3y)(7x + 3y)$

9. $(2x^2 - y^2)(2x^2 + y^2)$

19. $(-5x^3 + 3)(-5x^3 - 3)$

10. $(3x^2 - x)(3x^2 + x)$

20. $(x^2 - 8x)(x^2 + 8x)$

Factoring Monomials From Polynomials

To factor a polynomial, write the polynomial as a product of other polynomials.

For example, $4x^2 - 8x$ can be written as $4x(x - 8)$.

$4x$ is the **Greatest Common Factor (GCF)** of $4x^2$ and $8x$.

$4x$ is a **Common Monomial Factor** of the terms of the binomial.

$x - 8$ is a **Binomial Factor** of $4x^2 - 8x$.

Factor.

1. $9a^2 - 18a$

11. $x^3 - 5x^2$

2. $16a^5b^3 + 32a^4b$

12. $9c - 3c^2$

3. $x^2 + x^4 + x^3$

13. $5x^4 - 12x^2$

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

14. $x^2 + x$

5. $2x^3 - x$

15. $6x^2 - 12x^3 - 18x^4$

6. $3a^5 - a^3$

16. $x^3y^4 + x^2y^2$

7. $32b^2 + 16b$

17. $18b - 9b^2$

8. $5x^3 - 7x^2$

18. $2x^3 + 6x^2$

9. $3x^2 - 10x^3$

19. $12x^3 + 4x^2$

10. $a^{5n} + a^{3n}$

20. $x^5 + 3x^2$

Factoring Trinomials of the form $x^2 + bx + c$

$$a^2 - 8a + 15 = (a - 5)(a - 3)$$

Factor.

1. $x^2 - 8x + 16$

11. $x^2 + x - 132$

2. $x^2 - 12x + 20$

12. $x^2 - 8xy + 33y^2$

3. $x^2 - 12x + 11$

13. $a^2 - 10ab - 24b^2$

4. $c^2 + c - 20$

14. $m^2 - 3mn + 2n^2$

5. $x^2 + 12x + 36$

15. $x^2 + 15xy + 44y^2$

6. $x^2 - x - 6$

16. $t^2 + 23t + 42$

7. $x^2 + 12x + 35$

17. $y^2 - 12y + 36$

8. $x^2 - 9x + 18$

18. $b^2 - 4b - 45$

9. $y^2 - 13y + 42$

19. $n^2 + 3n - 18$

10. $x^2 + 6x - 40$

20. $c^2 - 10c + 21$

Name _____

Factoring

Factoring Trinomials of the form $x^2 + bx + c$

$$x^2 + 3x - 28 = (x + 7)(x - 4)$$

Factor.

1. $x^2 + 4x - 5$

11. $x^2 - 8x + 15$

2. $x^2 + 15x + 50$

12. $x^2 + x - 72$

3. $x^2 + 4x - 32$

13. $x^2 - 16x + 39$

4. $x^2 + 7x + 6$

14. $x^2 + 22x + 121$

5. $x^2 + 12x + 11$

15. $x^2 + 13x + 12$

6. $x^2 + 12x + 20$

16. $x^2 - 3xy + 2y^2$

7. $x^2 + 2x - 35$

17. $x^2 - 14xy + 24y^2$

8. $x^2 - 18x + 72$

18. $x^2 + 5xy + 6y^2$

9. $x^2 - 15x + 56$

19. $x^2 + 2xy - 63y^2$

10. $x^2 - 6x - 16$

20. $x^2 + 8xy - 33y^2$