Pre-Calculus Name_____

# Parts of Polynomials

**Tell whether the following equations are polynomials. Explain why or why not.**

1) $y = x^2 + 3x - 7$

2) $y = x^{-2} + 3x^{-1} - 7$

3) $y = \sqrt{x} - 7$

4) $y = x - \sqrt{7}$

5) $y = \dfrac{x^2}{7}$

6) $y = \dfrac{7}{x^2}$

7) $y = x^{\frac{3}{5}} + 3x^{\frac{1}{4}} - 7^{\frac{1}{2}}$

8) $y = x^3 + 3x^2 - 7^{\frac{1}{2}}$

9) $xy = x^3 + 3x^2 - 7$

10) $\dfrac{1}{y} = x^3 + 3x^2 - 7$

**For each polynomial below, state its degree, coefficients, leading coefficient, and constant.**

11) $f(x) = 2x^3 - 3x^2 + 4x - 1$

12) $f(x) = 5 - 4x + 2x^2$

13) $f(x) = 4^2x^2 + 3^2x - 2^2$

14) $f(x) = \dfrac{1}{5}x + \dfrac{1}{4}$

15) $f(x) = x$

16) $f(x) = x^5 + 2x^4 - 3x^3 - 4x^2 + 5x^0$

Pre-Calculus Name_____

# Operations on Polynomials

**Simplify each sum.**

1) $(-6k + 7k^3) + (4k - k^3)$

2) $(7p^3 + p) + (8p^4 + 2p^3)$

3) $(6n^2 + 8n^3 + 5n^4) + (2n^2 - 5n^3)$

4) $(2m^3 - 5m^4 + 3m^2) + (7m^4 - 8m^3)$

5) $(-5 - x^2 + x) + (-5x^2 + 4x + 6 + 7x^4)$

6) $(8p^2 - 6 - 4p^3) + (2p^3 + 6p^2 + 4p^4 + 1)$

**Simplify each difference.**

7) $(-6 - 6b^3) - (-4 + 5b^4)$

8) $(7r^3 + 5) - (4r^3 + 7)$

9) $(-4x - 2x^2 + 5x^3) - (-7x + 2x^3 + 3x^2)$

10) $(8 - 8a^4 - a^2) - (-3 + 4a^2 - 3a^4)$

11) $(7a^2 - a^3 + 3a^4 - 5) - (2a^2 + 4a^4 - 1)$

12) $(-5 + 5k + 8k^2 + 5k^4) - (8 + 4k^4 + 4k)$

**Find each product.**

13) $-2(8n - 8)$

14) $-7(-5b - 8)$

15) $(p - 7)(p + 7)$

16) $(7n - 5)(7n + 5)$

17) $(7a - 8)(8a + 5)$

18) $(-2r + 4)(8r + 8)$

19) $(n - 7)^2$

20) $(5m - 8)^2$

21) $(2x^2 - 3x - 3)(2x - 2)$

22) $(6v^2 - 3v - 2)(-2v + 4)$

23) $(-7n^2 - n + 4)(-7n^2 - 2n + 8)$

24) $(6x^2 + 2x - 4)(-3x^2 - 2x + 7)$

Pre-Calculus Name_____

# Finding Roots by Solving (Linear)

**Find the roots by solving for x.**

1) $x - y = -2$

2) $3x + y = -5$

3) $3x - 2y = 10$

4) $y = 3x - 1$

5) $y = x - 5$

6) $y = \frac{7}{4}x + 4$

7) $0 = -5x + 10 + 2y$

8) $3 - y = -2x$

9) $-3y + 15 = -3x$

10) $10 + 2x - 5y = 0$

Pre-Calculus Name_____

# Finding Roots by Factoring (Linear)

**Factor each linear function, and then find the roots.**

1) $y = 3x - 3$

2) $y = 6x + 4$

3) $y = 2x - 1$

4) $y = -x + 3$

5) $y = -2x - 3$

6) $y = 4x - 5$

7) $y = -\frac{5}{3}x - 4$

8) $y = -\frac{2}{5}x - 3$

9) $y = -\frac{1}{2}x - 3$

10) $y = \frac{5}{4}x - 3$

Pre-Calculus Name_____

# Converting Between Linear Forms

**Convert slope-intercept form into standard and factored forms for each linear function below.**

1) $y = 5x - 4$

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

3) $y = \frac{1}{6}x - 5$

4) $y = -\frac{3}{2}x - 1$

**Convert standard form into slope-intercept and factored forms for each linear function below.**

5) $3x + 4y = -32$

6) $11x + 4y = 16$

7) $2x - y = 3$

8) $2x + 5y = 35$

**Convert factored form into slope-intercept and standard forms for each linear function below.**

9) $y = 3(x + 4)$

10) $y = -2(x - 8)$

11) $y = \frac{3}{2}(x - 6)$

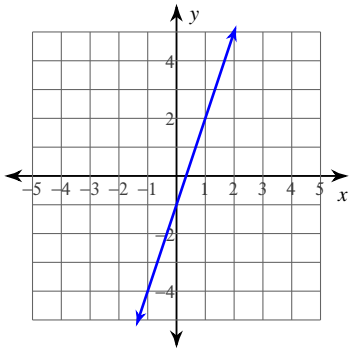
12) $y = -\frac{1}{2}\left(x + \frac{3}{4}\right)$

Pre-Calculus Name_____

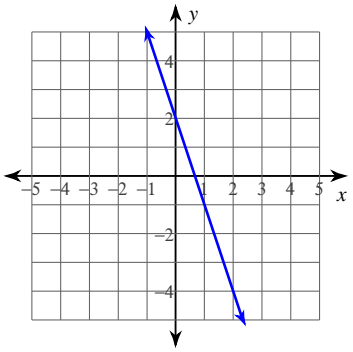
# Writing Equations of Lines

**Write the slope-intercept form of the equation of each line.**

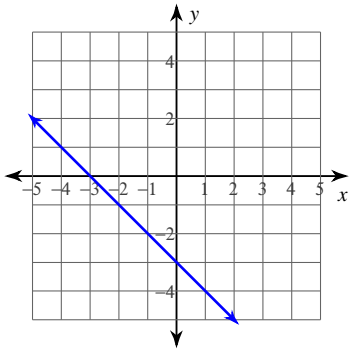
1)



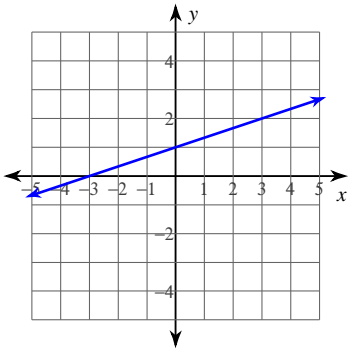

2)




3)




4)




**Write the slope-intercept form of the equation of each line given the slope and y-intercept.**

5) Slope $= \frac{1}{3}$, y-intercept = 2

6) Slope = 5, y-intercept = 0

**Write the slope-intercept form of the equation of the line through the given point with the given slope.**

7) through: $(-4, 4)$, slope $= -\frac{3}{4}$

8) through: $(5, 0)$, slope $= -\frac{2}{5}$

**Write the slope-intercept form of the equation of the line through the given points.**

9) through: $(-1, -2)$ and $(3, 4)$

10) through: $(-1, 1)$ and $(-4, 3)$

**Write the slope-intercept form of the equation of the line described.**

11) through: $(-1, -4)$, parallel to $y = 8x + 2$

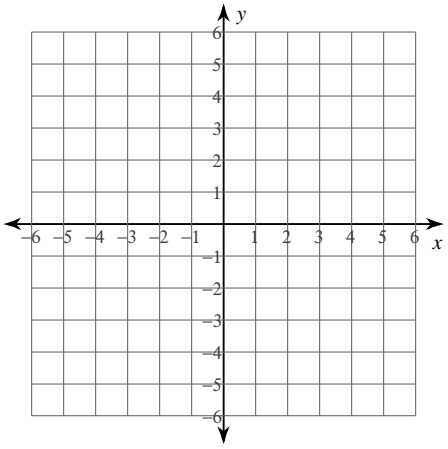
12) through: $(-2, 3)$, perp. to $y = \frac{3}{2}x + 2$

Pre-Calculus Name_____

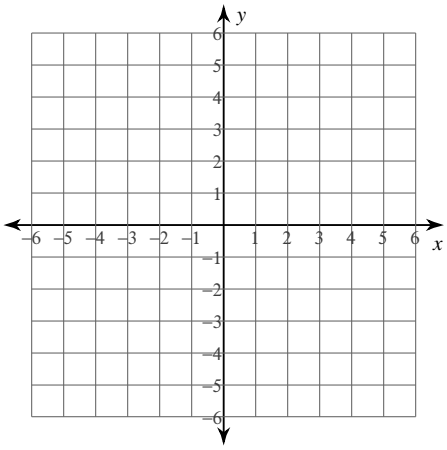
# Graphing Linear Functions

**Sketch the graph of each line.**

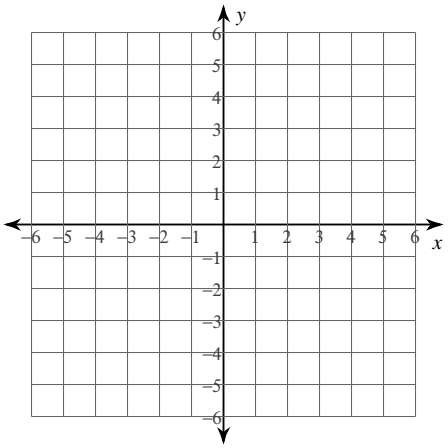
1) $x$-intercept = $-1$, $y$-intercept = 5



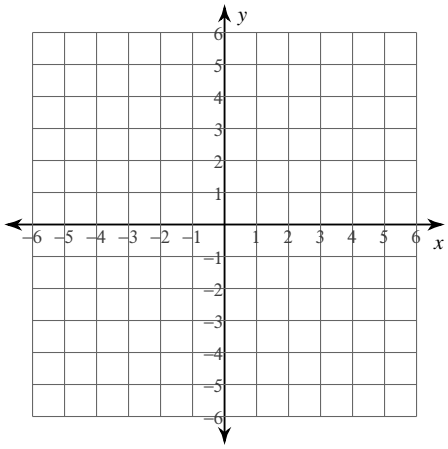

2) $x$-intercept = $-4$, $y$-intercept = 4



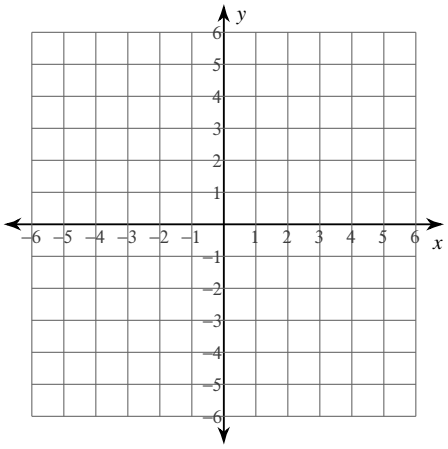

3) $y = -2x + 5$



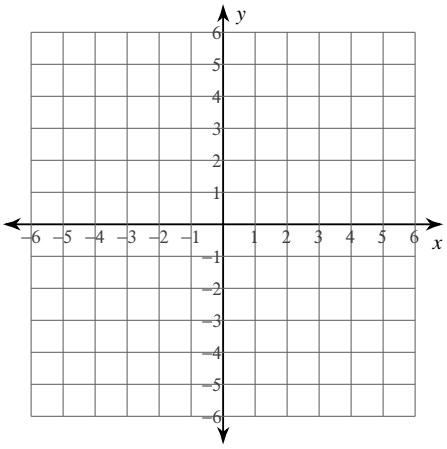

4) $y = -x + 2$



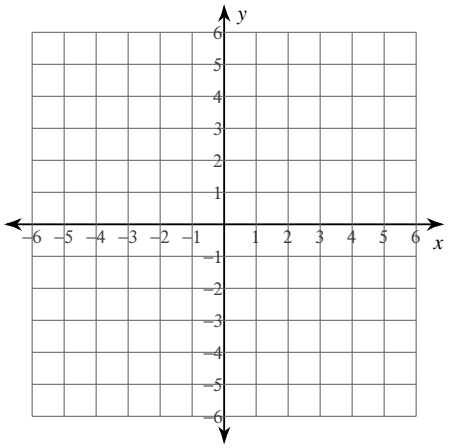

5) $x = -3$



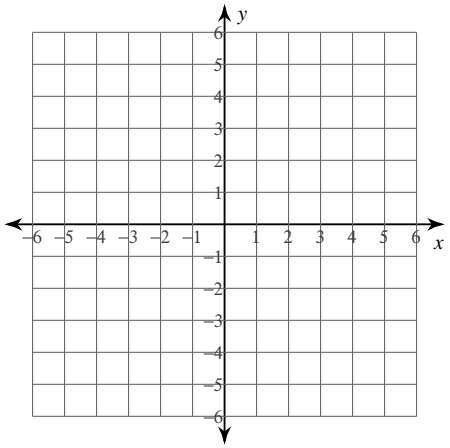

6) $y = 5$



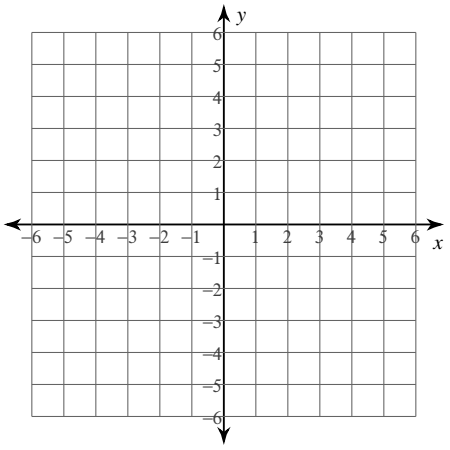
7) $y = \frac{2}{3}x$



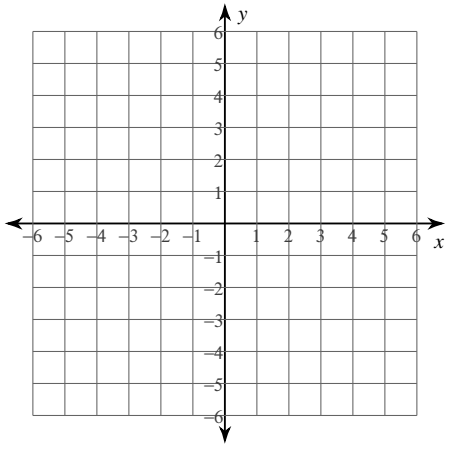
8) $y = -\frac{2}{3}x + 3$



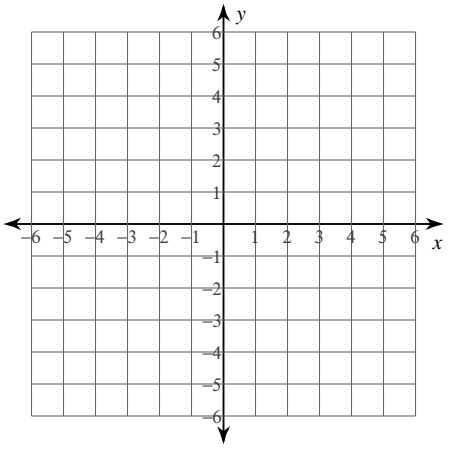
9) $y = \frac{2}{5}x + 2$



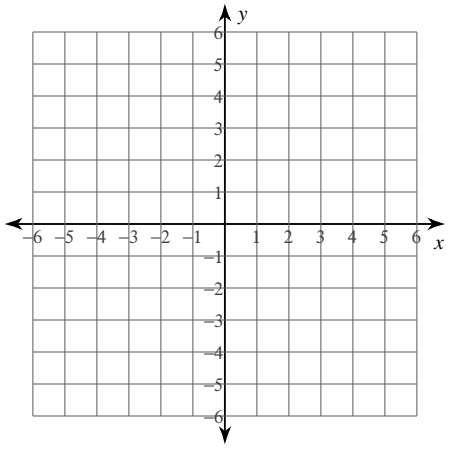
10) $y = \frac{1}{3}x + 4$



11) $y = -\frac{5}{4}x + 3$



12) $y = \frac{1}{4}x + 3$

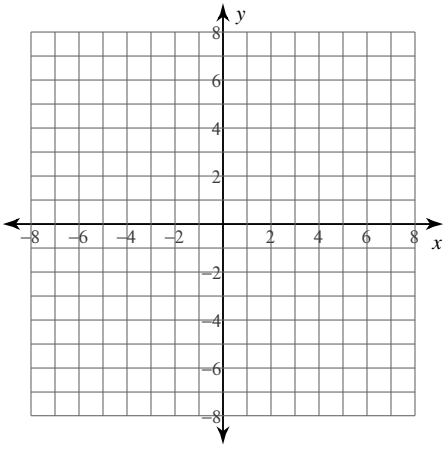


Pre-Calculus Name_____

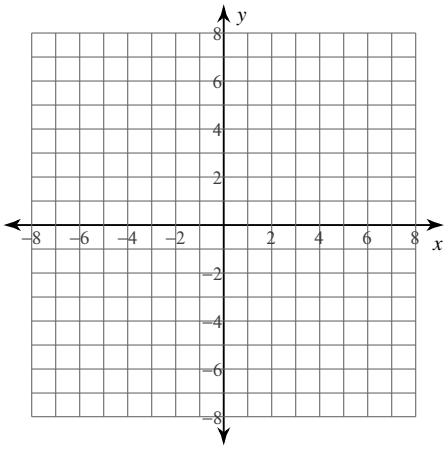
# Parts of Quadratics

**Identify the vertex, axis of symmetry, and y-intercept of each. Then sketch the graph.**

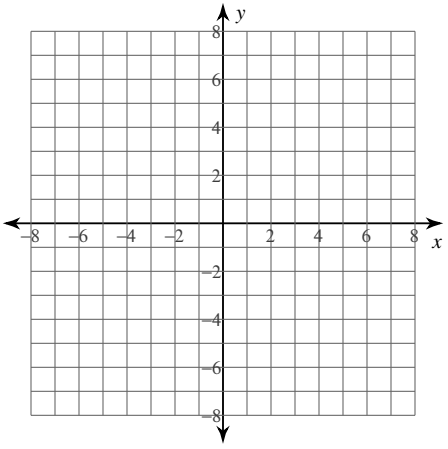
1) $y = x^2 - 2x - 4$



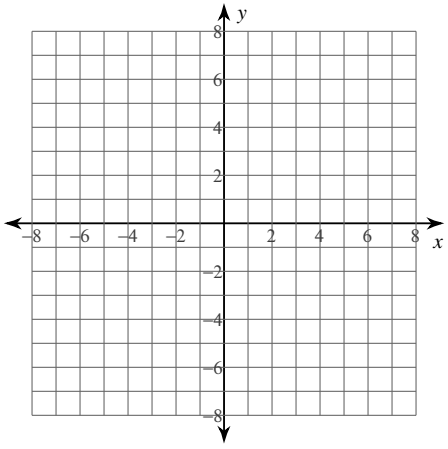

2) $y = -x^2 - 6x - 6$



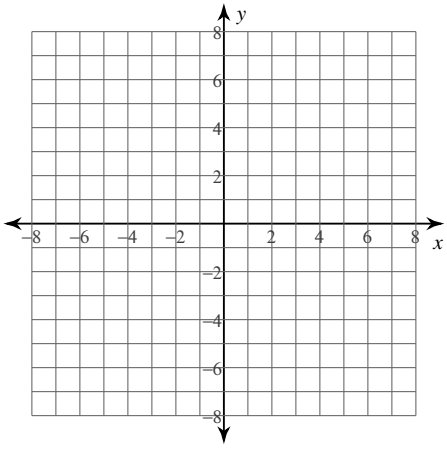

3) $y = 2x^2 + 16x + 27$



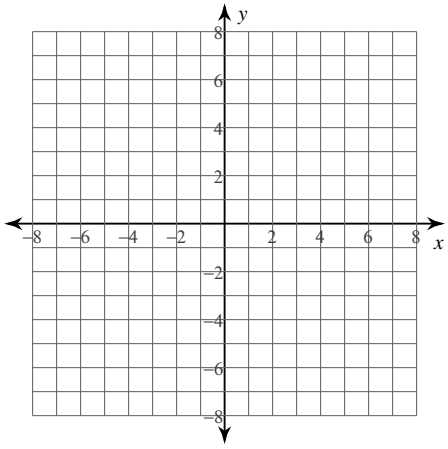

4) $y = 2x^2 + 4x - 1$



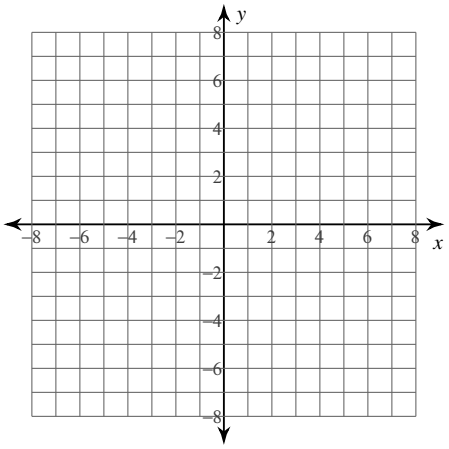

5) $y = (x + 2)^2 - 3$



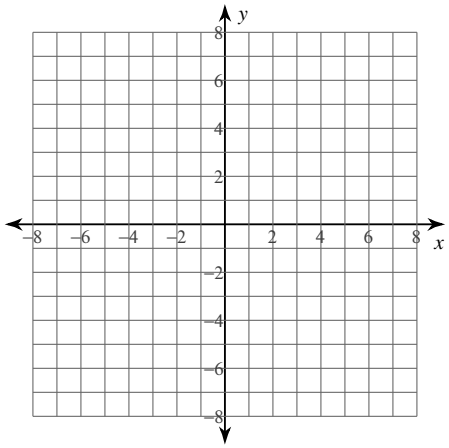

6) $y = -(x + 6)^2 + 4$



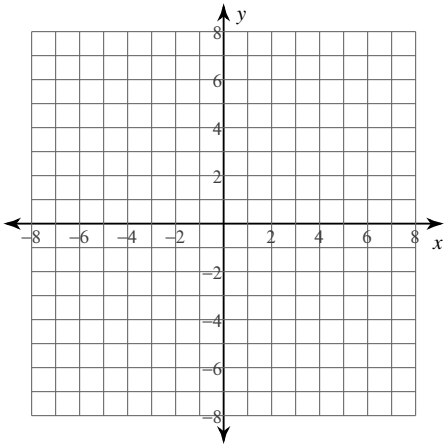
7) $y = 2(x+4)^2 - 6$



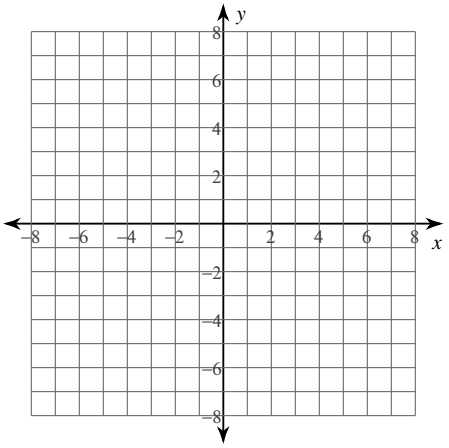

8) $y = \frac{1}{2}(x+4)^2 - 1$



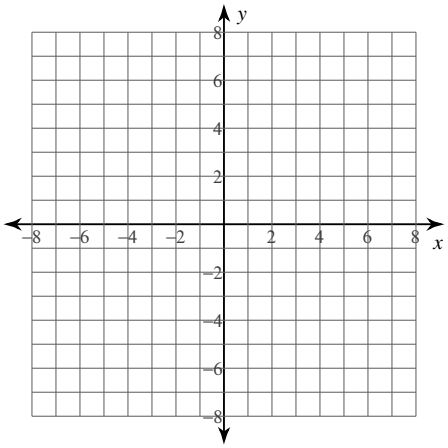

9) $y = -(x-6)(x-5)$



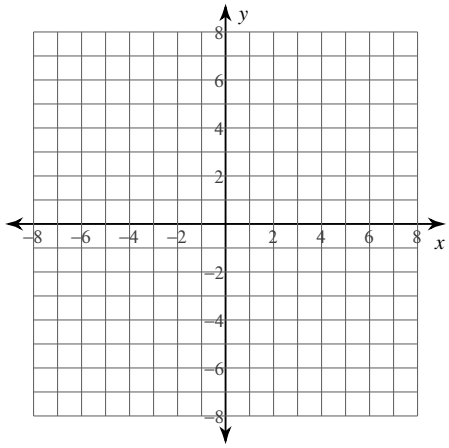

10) $y = (x-4)(x+1)$




11) $y = (x-3)(x+1)$




12) $y = (x+2)^2$



Pre-Calculus Name_____

# Finding Roots by Solving (Quadratic)

**Find the roots by solving.**

1) $n^2 = 4$

2) $x^2 = 81$

3) $k^2 = 64$

4) $x^2 = 0$

5) $p^2 = 11$

6) $x^2 = 67$

7) $n^2 = -89$

8) $b^2 = -52$

9) $25v^2 = 100$

10) $x^2 - 5 = 95$

11) $b^2 - 1 = 48$

12) $36n^2 = 81$

13) $3m^2 = 153$

14) $10n^2 = 440$

15) $b^2 + 1 = -10$

16) $v^2 + 8 = 33$

17) $81n^2 - 1 = 3$

18) $4a^2 + 9 = 90$

19) $4k^2 - 1 = 35$

20) $2 + 81x^2 = 11$

21) $9r^2 + 3 = 471$

22) $8x^2 - 7 = 561$

23) $7n^2 + 10 = 38$

24) $5x^2 - 8 = -66$

Pre-Calculus Name_____

# Finding Roots by Factoring (Quadratic)

**Find the roots of the quadratics below.**

1) $x(5x-1)=0$

2) $(v-6)(v+3)=0$

3) $(m-8)(4m+3)=0$

4) $(7x-3)(8x+1)=0$

**Factor the the quadratics below, and then find the roots.**

5) $v^2-9$

6) $x^2-16$

7) $9r^2-4$

8) $4x^2-9$

9) $r^2+4r+4$

10) $m^2+2m+1$

11) $4n^2-20n+25$

12) $9x^2+24x+16$

13) $k^2-4k-45$

14) $2p^2-8p-24$

15) $6r^2+54r+48$

16) $2x^2-26x+60$

17) $6n^2-72n+210$

18) $6n^2-6n-336$

19) $5a^2+23a-42$

20) $7x^2-64x+9$

21) $7x^2+80x+100$

22) $5k^2-29k+20$

23) $8v^2-41v+36$

24) $4x^2+29x+30$

25) $36p^2-282p+540$

26) $60n^2-102n-378$

Pre-Calculus Name_____

# Finding Roots Using Quadratic Formula

**Solve each equation with the quadratic formula.**

1) $-b^2 + 3b + 18 = 0$

2) $-2k^2 - 3k + 54 = 0$

3) $r^2 - 16 = 0$

4) $-6x^2 + 54 = 0$

5) $3m^2 + 7m + 2 = 0$

6) $-3b^2 + 27 = 0$

7) $n^2 + 4n - 12 = 0$

8) $-2p^2 - p + 55 = 0$

9) $-6v^2 + 7v + 55 = 0$

10) $2x^2 - 8 = 0$

11) $-12r^2 - 3r + 5 = 0$

12) $-12x^2 + 7x - 9 = 0$

13) $2n^2 - 6n - 56 = 0$

14) $-a^2 + 4a + 6 = 0$

15) $-2x^2 + 3x - 1 = 0$

16) $x^2 - x - 110 = 0$

17) $3k^2 + 3k - 18 = 0$

18) $m^2 - 144 = 0$

19) $8x^2 - 3x + 12 = 0$

20) $5p^2 - 20 = 0$

Pre-Calculus Name_____

# Solving Systems of Equations (Elimination)

**Solve each system by elimination.**

1) $4x - 8y = -8$
$-4x - 2y = 28$

2) $-5x - 8y = 0$
$-7x - 8y = 16$

3) $8x + 14y = 22$
$-4x - 7y = -11$

4) $12x - 9y = -30$
$4x - 3y = -14$

5) $-18x + 36y = -18$
$-12x + 24y = -24$

6) $45x + 40y = -15$
$63x + 56y = -21$

7) $-2x - y - 4z = 3$
$-2x - 3y - 2z = 11$
$2x + 2y + 3z = -7$

8) $-3x + 4y - 3z = 4$
$-x - 6y + 4z = -23$
$5x + 3y + 2z = 29$

9) Amy's school is selling tickets to a play. On the first day of ticket sales the school sold 7 senior citizen tickets and 8 child tickets for a total of $138. The school took in $210 on the second day by selling 7 senior citizen tickets and 14 child tickets. Find the price of a senior citizen ticket and the price of a child ticket.

10) The school that Beth goes to is selling tickets to a choral performance. On the first day of ticket sales the school sold 9 senior citizen tickets and 2 student tickets for a total of $101. The school took in $38 on the second day by selling 2 senior citizen tickets and 2 student tickets. What is the price each of one senior citizen ticket and one student ticket?

11) A parabola goes through the points (1, 4), (-2, 7), and (2, 15). Find the equation of this parabola in general form.

Pre-Calculus Name_____

# Reducing Radicals

**Simplify.**

1) $\sqrt{36}$

2) $\sqrt{16}$

3) $\sqrt{180}$

4) $\sqrt{100}$

5) $\sqrt{192}$

6) $\sqrt{48}$

7) $-5\sqrt{98}$

8) $-3\sqrt{48}$

9) $\sqrt{24n^4}$

10) $\sqrt{12x^4}$

11) $\sqrt{192b}$

12) $\sqrt{343n^2}$

13) $\sqrt{294v}$

14) $\sqrt{147x^2}$

15) $\sqrt{216x^3y^3}$

16) $\sqrt{216x^3y^4}$

17) $\sqrt{175x^4y^4z^3}$

18) $\sqrt{32xy^4z^3}$

Pre-Calculus Name_____

# Simplifying Radical Expressions

**Simplify.**

1) $-2\sqrt{6} - 2\sqrt{6}$

2) $3\sqrt{3} - \sqrt{3}$

3) $3\sqrt{2} + 3\sqrt{2}$

4) $-3\sqrt{6} - 2\sqrt{6}$

5) $-\sqrt{54} + 2\sqrt{2} + 3\sqrt{24}$

6) $-2\sqrt{18} + 3\sqrt{8} + 3\sqrt{18}$

7) $2\sqrt{20} + 3\sqrt{18} + 2\sqrt{20}$

8) $-2\sqrt{2} + 2\sqrt{2} - 3\sqrt{54}$

9) $\sqrt{6} \cdot \sqrt{20}$

10) $\sqrt{12} \cdot \sqrt{3}$

11) $5\sqrt{3} \cdot 2\sqrt{2}$

12) $5\sqrt{5} \cdot \sqrt{15}$

13) $\sqrt{6}(\sqrt{2} + \sqrt{6})$

14) $-\sqrt{5}(\sqrt{6} + \sqrt{10})$

15) $(\sqrt{2} - 3)(\sqrt{2} - 2)$

16) $(-2 + \sqrt{2})(2 - 2\sqrt{2})$

17) $\dfrac{\sqrt{2}}{\sqrt{18}}$

18) $\dfrac{\sqrt{15}}{3\sqrt{12}}$

19) $\dfrac{\sqrt{3}}{3\sqrt{25}}$

20) $\dfrac{\sqrt{2}}{\sqrt{32}}$

21) $\dfrac{2 - \sqrt{3}}{3\sqrt{25}}$

22) $\dfrac{-2 - \sqrt{2}}{\sqrt{25}}$

23) $\dfrac{4}{4 - 4\sqrt{2}}$

24) $\dfrac{5 - \sqrt{2}}{5 + 5\sqrt{5}}$

Pre-Calculus Name_____

# Solving Radical Equations

**Solve each equation. (Remember to check for extraneous solutions.)**

1) $\sqrt{x+9} = 8$

2) $1 = \sqrt{x}$

3) $4 = \sqrt{k}$

4) $\sqrt{81p} = 9$

5) $6 = \sqrt{n}$

6) $\sqrt{x} = 5$

7) $2 = \sqrt{n-9}$

8) $\sqrt{1-12m} = 7$

9) $\sqrt{2n} = 2$

10) $\sqrt{p+7} = 7$

11) $\sqrt{2n-11} = 1$

12) $\sqrt{1-5k} = 6$

13) $\sqrt{2k+1} = \sqrt{3k-1}$

14) $\sqrt{2n+1} = \sqrt{3n-2}$

15) $\sqrt{-2-3x} = \sqrt{x+6}$

16) $\sqrt{2n-3} = \sqrt{6-n}$

Pre-Calculus Name_____

# Writing Equations of Polynomials

**Use the roots to write the equation in both factored and general form for a polynomial of least degree.**

1) $-4$

2) $3$

3) $-3,\ 1$

4) $-2,\ -4$

5) $-2,\ 0,\ -1$

6) $5,\ -5,\ -1$

7) $-1,\ -3,\ 0,\ -2$

8) $1,\ 0,\ -3,\ -4$

9) double root at $3$

10) double root at $-4$ and single root at $-2$

Pre-Calculus Name_____

# Graphing Polynomials

**Without using the calculator, sketch the general shape of each function, and describe its end behavior.**

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

2) $f(x) = x^2 - 8x + 14$

3) $f(x) = -x^5 + 3x^3 - 1$

4) $f(x) = -x^2 + 8x - 18$

5) $f(x) = -x^3 + 4x^2 - 4$

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

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

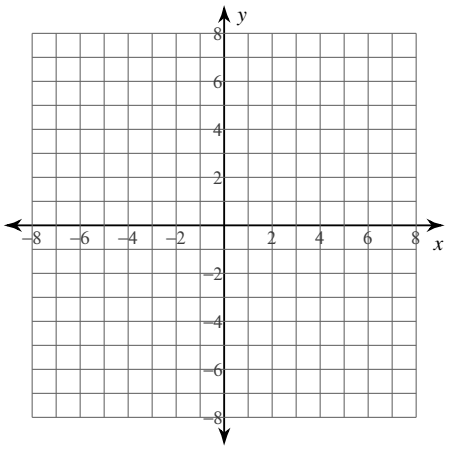
8) $f(x) = -x^4 + 2x^2 - x + 2$

9) $f(x) = x^4 - 2x^2 - x - 1$

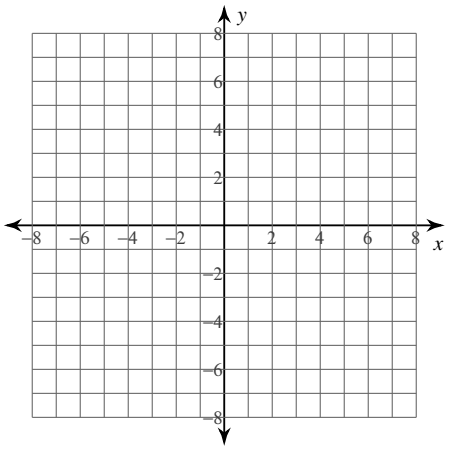
10) $f(x) = -x^5 + 3x^3 + 2$

**Use the calculator to sketch the graph of each function, and then find the domain and range, any roots, and the y-intercept.**

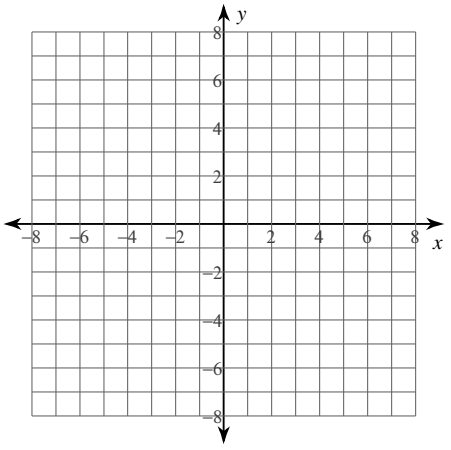
11) $f(x) = -x^2 + 8x - 14$



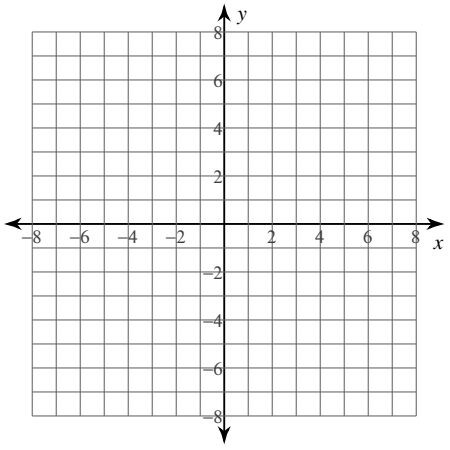

12) $f(x) = x^5 - 3x^3 + 3$



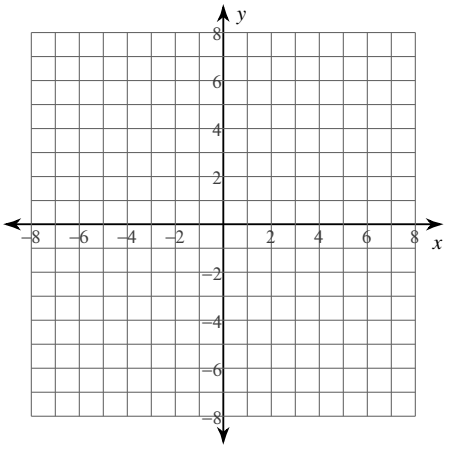

13) $f(x) = x^3 - 14x^2 + 64x - 94$



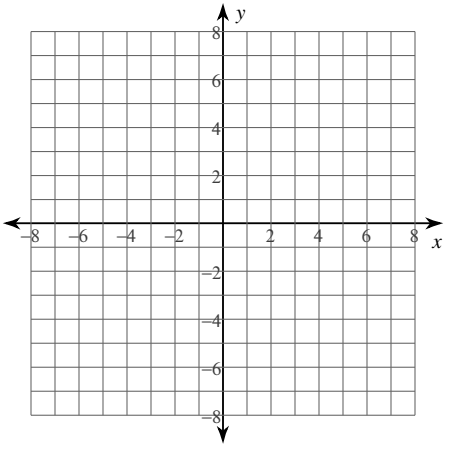

14) $f(x) = x^3 - 2x^2 + 4$




15) $f(x) = -x^4 + 2x^2 - 2x - 3$




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

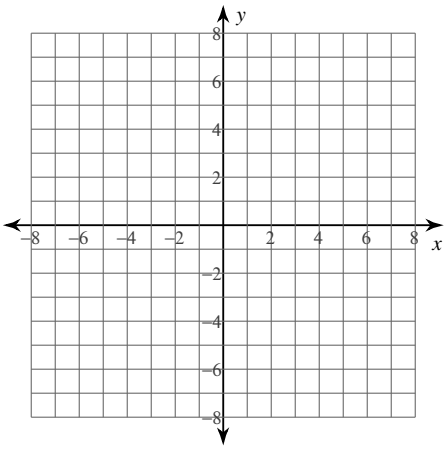


Pre-Calculus Name_____

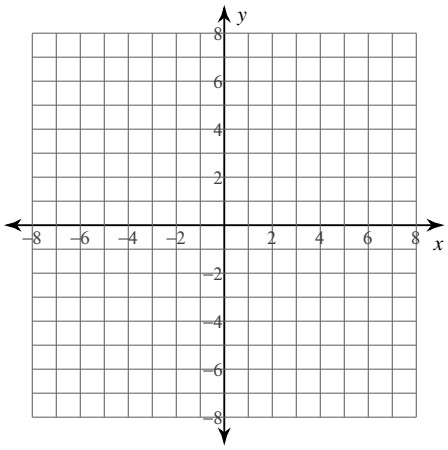
# Graphing Radicals

**Neatly sketch the graph, and then find the domain and range, any roots, and the y-intercept.**

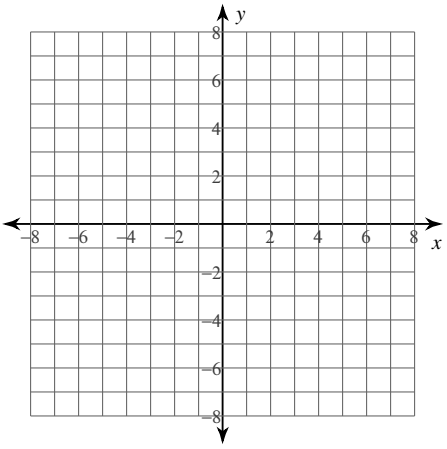
1) $y = 3\sqrt{x}$



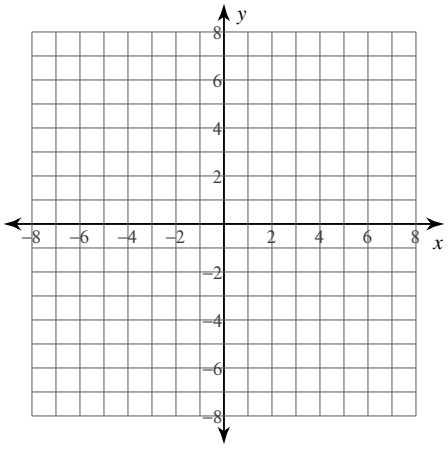

2) $y = \sqrt{x}$



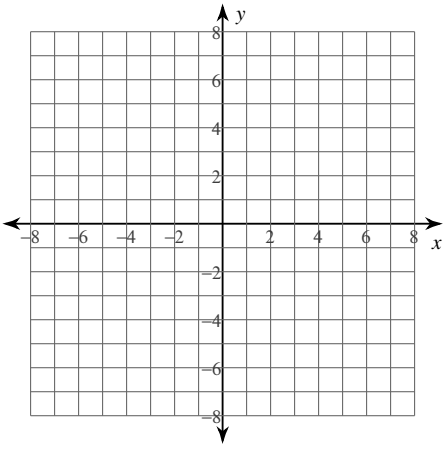

3) $y = 3\sqrt{x} - 3$



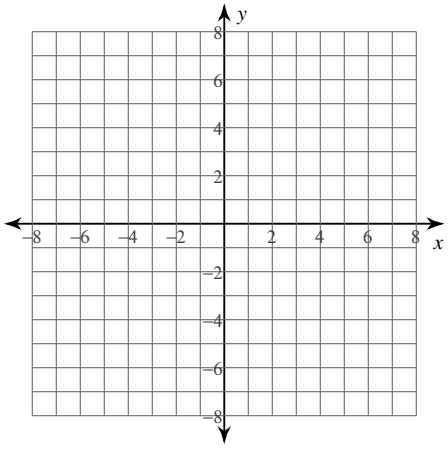

4) $y = \sqrt{x} - 1$



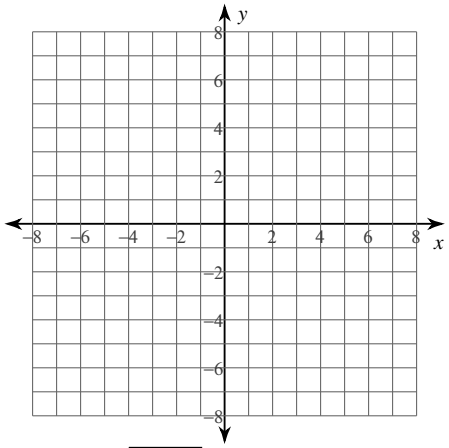

5) $y = -2\sqrt{x+4}$



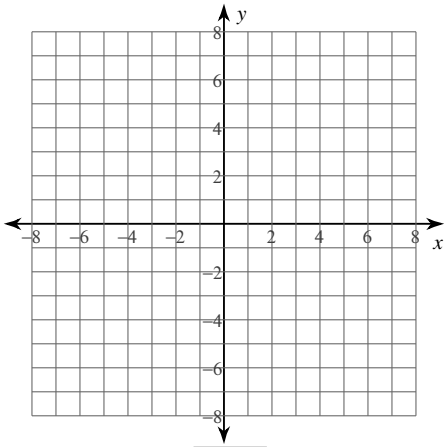

6) $y = \sqrt{x-2}$



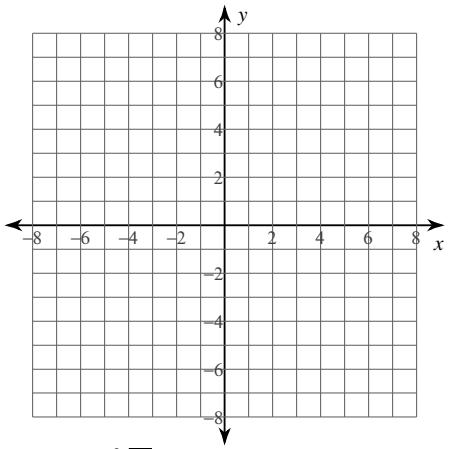
7) $y = \sqrt{x+2} - 5$



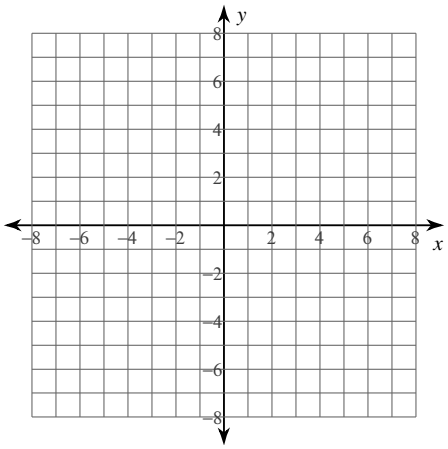
8) $y = 2\sqrt{x+4} - 5$



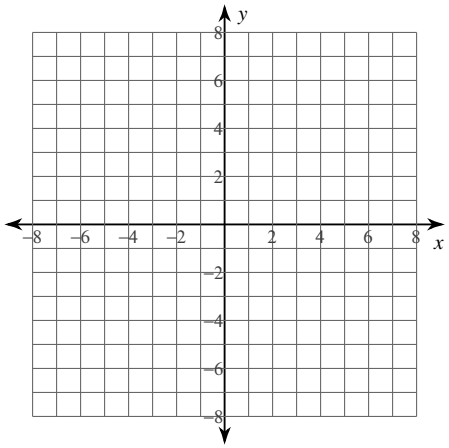
9) $y = 2\sqrt{x+2} - 4$



10) $y = 1 + 2\sqrt{x+5}$



11) $y = \sqrt[3]{x} - 3$



12) $y = \sqrt[3]{x+3} - 1$