Assignment

Name _____ Date _____

Roots and Zeros
Calculating Roots of Quadratic Equations and Zeros of Quadratic Functions

Factor and solve each quadratic equation, if possible. Check your answers.

1. $x^2 + 5x - 24 = 0$

2. $x^2 - 6x + 9 = 0$

3. $x^2 + 13x + 30 = 0$

4. $x^2 - 15x + 36 = 0$

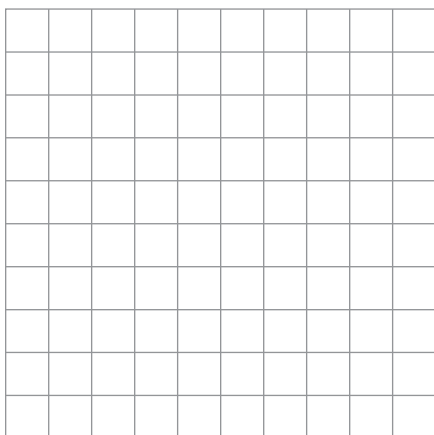**Calculate the root(s) of each quadratic equation. Check your answers.**

5. $x^2 - 144 = 0$

6. $x^2 - 7x + 12 = 0$

7. Use the quadratic function $f(x) = x^2 - 6x + 5$ to answer parts (a) through (c).

   a. Graph the quadratic function on the grid below.

   b. Identify the vertex, x- and y-intercepts and line of symmetry. Label each on the graph.

   Vertex:

   y-intercept:

   x-intercept(s):

   Line of symmetry:

   c. What are the zeros of $f(x) = x^2 - 6x + 5$?

Calculate the zeros of each quadratic function, if possible. Check your answers.

8. $f(x) = x^2 - 11x + 28$

9. $f(x) = x^2 + 4x - 45$

10. $f(x) = x^2 - 6x + 14$
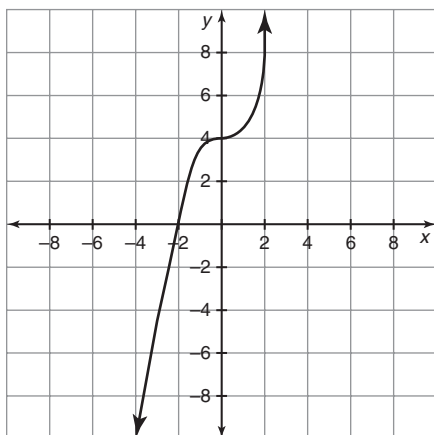
11. $f(x) = x^2 + 18x + 81$

**12.** $f(x) = x^2 - 10x + 24$

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Poly High
Factoring Polynomials

The graph of the polynomial function f(x) = $\frac{1}{2}x^3$ + 4 is shown below.
Use this function and its graph to answer Questions 1 and 2.

1. Identify the zero(s), *y*-intercept, and line of symmetry for *f(x)*. Label each on the graph.

   a. zero(s):

   b. *y*-intercept:

   c. line of symmetry:

2. Sketch the graph of each transformed function on the same graph as *f(x)* below.

   a. *f(x)* − 4

   b. *f(x)* − 3
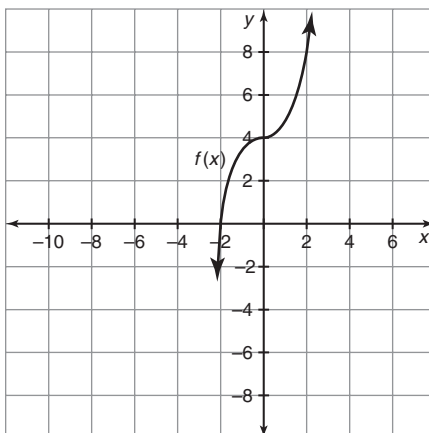
3. Describe how each graph is formed from the graph of $f(x)$.

a. Six is subtracted from x: $f(x) - 6$.
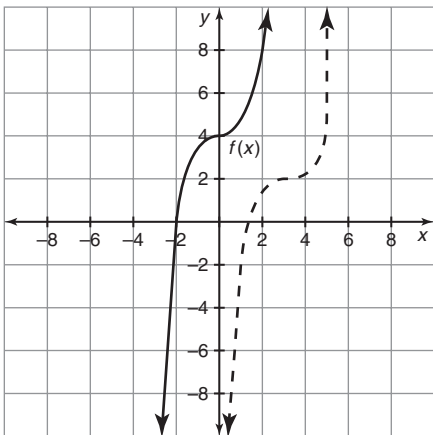
b. Four is added to $f(x)$: $f(x) + 4$.

4. Write a function in terms of $f(x)$ for each of the following.

a. The graph of $f(x)$ is shifted up 3 units.

b. The graph of $f(x)$ is shifted left 10 units.

c. The graph of $f(x)$ is shifted right 2 units and down 5 units.

5. The graph of $f(x)$ is shown. Write a function in terms of $f(x)$ for the transformed graph.

Factor and solve each polynomial equation.

6.   a. $x^2 + 2x - 8 = 0$

b. $x^2 - 12x + 27 = 0$

7.   a. $x^4 + 5x^2 + 6 = 0$

b. $x^4 - 13x^2 + 36 = 0$

8. **a.** $9x^3 + 72x^2 - 81x = 0$

b. $3x^4 - 24x^3 + 45x^2 = 0$

9. a. $x^2 - x - 2x + 2 = 0$

b. $3x^4 - 9x^3 - 12x^2 + 36x = 0$

Assignment

Name _____ Date _____

Rational Thinking
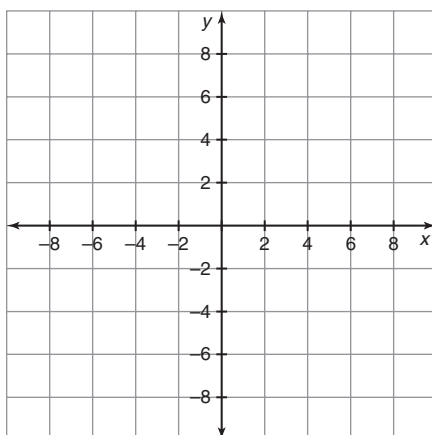## Rational Equations and Functions

For each rational function, complete the table of values, create a graph, name the domain, range, *x*- and *y*-intercepts and asymptotes.

1. For the rational function $y = \frac{1}{x}$, (a) complete the table of values, (b) create a graph, and (c) name the domain, range, *x*- and *y*-intercepts, and asymptotes.

   a. Complete the following table.

x	y
−4	
−2	
−1	
1	
2	
4	

   b. Graph the function.

c. Domain: all real numbers except 0

Range:

x-intercept(s):

y-intercept(s):

Asymptotes:

Solve each of the following rational equations.

2. **a.** $\dfrac{-4}{x} = -2$

b. $\dfrac{8}{x} - 3 = 17$

c. $\dfrac{18}{x} - 6 = \dfrac{3}{x}$

d. $\dfrac{4}{x} = 3 - \dfrac{4}{x}$

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Cross-multiply to solve each of the following rational equations. Identify any extraneous solutions and list any restrictions on the solution set.

3. **a.** $\dfrac{20}{x + 3} = 5$

b. $\dfrac{8}{x + 5} = \dfrac{10}{x + 9}$

c. $\dfrac{x + 4}{x - 6} = 6$

d. $\dfrac{x + 5}{x + 8} = \dfrac{1}{2}$

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4. a. $\dfrac{4}{x-3} + \dfrac{2x}{x^2-9} = \dfrac{1}{x+3}$

b. $\dfrac{1}{x+3} + \dfrac{1}{x-3} = \dfrac{1}{x^2-9}$

c. $\dfrac{5(x-4)}{x^2-16} + \dfrac{3x}{x+4} = 1$

Assignment

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Work, Mixture, and More
Applications of Rational Equations and Functions

Two teams of construction workers have been contracted to build an addition for your school library. If Team A works alone, they can complete the job in 32 days. If Team B works alone, they can complete the job in 20 days.

1. How much of the job can Team A complete in x days? How much of the job can Team B complete in x days? Which team can complete more of the job in the same number of days?

2. Suppose that Team A and Team B work together for x days. How much of the job can they complete in x days?

3. Write and solve an equation to calculate the number of days it would take both teams working together to complete the job.

A 250-milliliter acid solution contains 35% acid.

4. What would be the acid concentration if you added 30 milliliters of water to the solution? What would be the acid concentration if you added 100 milliliters of water to the solution?

5. Write a function to represent the fractional concentration $C(x)$ of the solution when x millimeters of water is added to the solution.

6. How much water should you add to the solution if you want a 10% acid solution?

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You buy a new fish tank for $800. It is estimated to cost about $125 each year to own including cleaning supplies, electricity, food, etc.

7. Assuming that these estimates are reliable, what is the average annual cost if you have the fish tank for 5 years? 10 years? 20 years?

8. Write a function that shows the average annual cost $C(x)$ of the fish tank over x years.

9. How many years did you have the fish tank if the average annual cost was $225?

10. Graph the function. Determine the domain, range, asymptotes, discontinuities, and end behavior of the function.
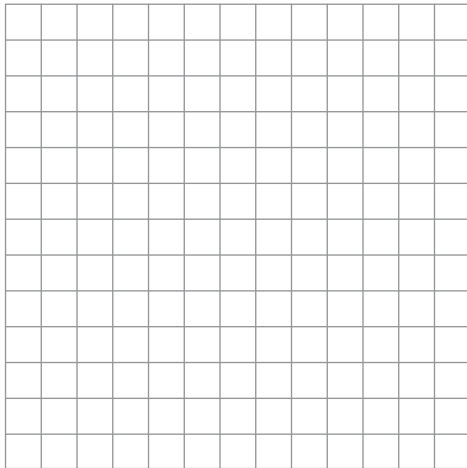
Domain:

Range:

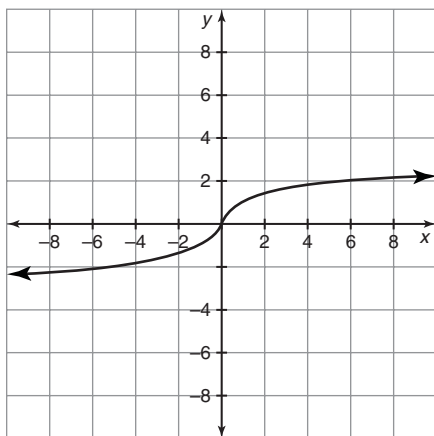Asymptotes:

Discontinuities:

End behavior:

Assignment

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Rad Man!
Radical Equations and Functions

The graph of the basic radical function $f(x) = \sqrt[3]{x}$ is shown below. Use this function and its graph to answer Questions 1 and 2 on the grid.

1. Identify the zero(s) and *y*-intercept of $f(x) = \sqrt[3]{x}$. Label each point on the graph.

   a. zero(s):

   b. *y*-intercept:

2. Sketch the graph of each transformed function on the same graph as *f(x)* below.

   a. $f(x) - 3$

   b. $f(x + 4)$
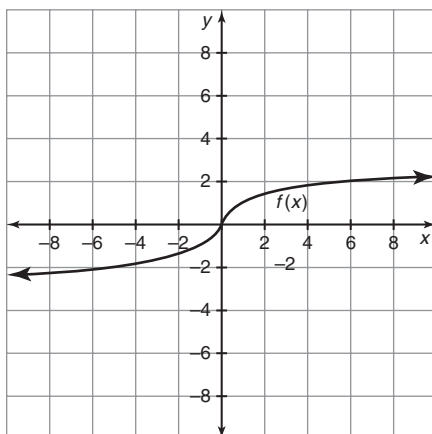
3. Describe how each graph is formed from the graph of $f(x)$.

   a. Five is subtracted from x: $f(x - 5)$.

   b. Seven is added to $f(x)$: $f(x) + 7$.

4. Write a function in terms of $f(x)$ for each of the following.

   a. The graph of $f(x)$ is shifted up 4 units.

   b. The graph of $f(x)$ is shifted left 8 units.

   c. The graph of $f(x)$ is shifted right 3 units and down 2 units.

Solve each equation for the unknown.

5. $\sqrt{x} = 8$ 6. $\sqrt{3x} = 12$

7. $\sqrt{x + 2} = 3$ 8. $\sqrt{x + 3} = 1$

9. $4\sqrt{x + 3} = 36$

10. $\frac{1}{2}\sqrt{x - 6} = 4$

11. $\sqrt[3]{x + 3} = 2$

12. $2\sqrt[3]{2x + 1} = 6$

Solve each equation of the following. Check for extraneous solutions or roots.

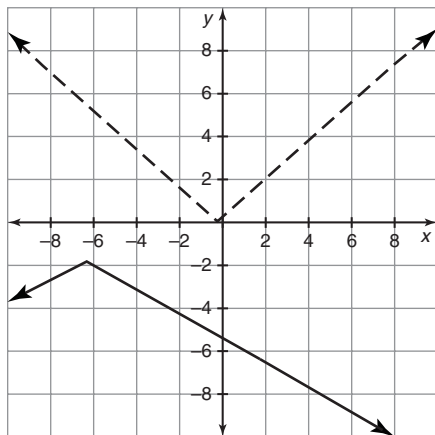**13.** $x - 2 = \sqrt{x + 3}$

14. $x + \sqrt{x} = 6$

15. $\sqrt[3]{x^3 + x^2 - 4x + 5} = x + 1$

Assignment

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Connections
Algebraic and Graphical Connections

The graph of the basic absolute value function $f(x) = |x|$ and a transformed absolute value function g(x) are shown on the grid. Use the functions and their graphs to answer Questions 1 through 4.

1. Identify each of the following characteristics for *f(x)*.

   a. *x*-intercept(s):

   b. *y*-intercept(s):

   c. Vertex:

   d. Line of symmetry:

2. Identify each of the following characteristics for *g(x)*.

   a. *x*-intercept(s):

   b. *y*-intercept(s):

   c. Vertex:

   d. Line of symmetry:

3. Describe how the graph of $g(x)$ is formed from the graph of $f(x)$ using four transformations.

4. a. Write a function for $g(x)$ in terms of $f(x)$.

b. Write a function for $g(x)$ using absolute value.

Solve each equation algebraically. Check your answers.

5. $2x - 4 = 0$
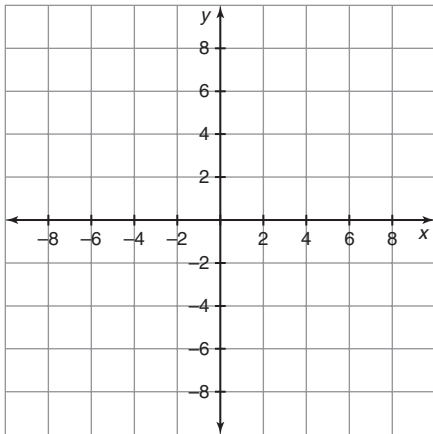
6. $\sqrt{x + 3} = 2$

7. $4^x = 4$

8. $x^2 + x - 6 = 0$

Solve the equation graphically.

9. $|x + 2| = x^2$

10

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