ALGEBRA 1

Teacher: _______________________

Unit 7
Chapter 10 & 11

This book belongs to:

__________________________
Warm-Up:

1.) Solve: $x^2 + 4x = 21$

2.) Describe how the function, $f(x) = (x - 3)^2 + 6$, is related to the graph of $g(x) = x^2$.

Square root functions or ______________________________ follow all the rules of any other function and will contain the square root of a variable. The radicand is the ____________________________.

Square Root Function

Parent Function: ______________________

Type of Graph: _________________

Domain: ________

Range: ________

The equation discussed above, $f(x) = \sqrt{x}$ is the most general of all radical functions.

More complex square root functions are in the form: ______________________________

Helpful Hints to graphing square root functions $f(x) = a\sqrt{x - h} + k$

- If $a$ is positive your curve should go ________________, if $a$ is negative your curve should go ________________.

- The starting point of your curve will be the point ______________
  
  o  $h$ moves every point of the parent function ______________

  o  $k$ moves every point of the parent function ________________
- When you make your $xy$-table your first $x$ and $y$ value should be $h$ and $k$
  
  o The best $x$ values to use will make your radicand a ____________________.
- Domain is __________
- Range is __________ (if $a$ is positive) or ____________ (if $a$ is negative)

Example 1: Graph the square root functions and identify the domain and range.

a) $f(x) = -2\sqrt{x}$

Example 2: Graph the radical functions and identify the domain and range.

a) $f(x) = \sqrt{x} + 3$

Example 3: Graph the radical functions. State the domain and range.

a) $f(x) = \sqrt{x} + 3$

b) $f(x) = -\sqrt{x} - 1$
**Algebra 1**  
**10.1 Square Root Functions**  
**Day 2**

**Warm-Up:**

Graph the function. Compare to the parent graph. State the domain and range.

1.) \( y = \frac{1}{2} \sqrt{x} \)

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Domain: ______________  
Range: ______________

2.) \( y = \sqrt{x + 1} \)

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Range: ______________

Now let’s combine everything we just did in examples 1-3.

**Example 4:** Graph the square root functions. State the domain and range.

a) \( f(x) = 2\sqrt{x + 3} + 1 \)

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Domain: ______________
Range: ______________

b) \( f(x) = -\sqrt{x - 4} \)

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Domain: ______________
Range: ______________
10.1 Day 2 Textbook Homework
10.1 Worksheet

Graph each function. State the domain and range.

1. \( y = \frac{4}{3} \sqrt{x} \)  
   - [Graph of \( y = \frac{4}{3} \sqrt{x} \)]

2. \( y = \sqrt{x} + 2 \)  
   - [Graph of \( y = \sqrt{x} + 2 \)]

3. \( y = \sqrt{x - 3} \)  
   - [Graph of \( y = \sqrt{x - 3} \)]

4. \( y = -\sqrt{x} + 1 \)  
   - [Graph of \( y = -\sqrt{x} + 1 \)]

5. \( y = 2\sqrt{x - 1} + 1 \)  
   - [Graph of \( y = 2\sqrt{x - 1} + 1 \)]

6. \( y = -\sqrt{x - 2} + 2 \)  
   - [Graph of \( y = -\sqrt{x - 2} + 2 \)]

7. **OHM’S LAW** In electrical engineering, the resistance of a circuit can be found by the equation \( I = \frac{P}{R} \), where \( I \) is the current in amperes, \( P \) is the power in watts, and \( R \) is the resistance of the circuit in ohms. Graph this function for a circuit with a resistance of 4 ohms.
Warm-Up:
Simplify each expression.

1.) \( \sqrt{54} \)
2.) \( 3\sqrt{24} \cdot 4\sqrt{6} \)

3.) \( \sqrt{60} \)
4.) \( \frac{\sqrt{5}}{t} \cdot \frac{t}{\sqrt{10}} \)

Adding and Subtracting Radicals
- You are allowed to add any radicals together if the radicand is the same.
- The radicand should always \( \text{______________________________} \) and numbers in front should be combined.
- JUST LIKE COMBINING LIKE TERMS

Ex: \( 8x - 5x = 3x \rightarrow 8\sqrt{2} - 5\sqrt{2} = \text{__________} \)

Ex: \( 2x + x + 4x = 7x \rightarrow 2\sqrt{3} + \sqrt{3} + 4\sqrt{3} = \text{__________} \)

Example 1:

\( a.) \ 11\sqrt{5} - 7\sqrt{5} + 3\sqrt{5} \)

\( b.) \ 3\sqrt{11} - 7\sqrt{5} + 2\sqrt{5} + 2\sqrt{11} \)

Look at this next problem: \( 3\sqrt{8} + 8\sqrt{2} - 2\sqrt{18} \)

- What do you notice?
- What can we do?
Example 2:

a.) $3\sqrt{12} - 8\sqrt{48} + \sqrt{75}$  

b.) $\sqrt{16} + 3\sqrt{10} + \sqrt{25} + 2\sqrt{200}$

Example 3: Find the perimeter of the square below:

![Square with side length $5\sqrt{3}$]
10.3 Day 1 Textbook Homework
Algebra 1
10.3 Operations with Radical Expressions
Day 2

Warm-Up:
1.) Simplify: $4\sqrt{2} + 4\sqrt{3} - 3\sqrt{2}$
2.) Multiply: $(x - 2)(x + 3)$
3.) Multiply: $(x - 1)^2$

Multiplying Radical Expressions
- Multiply all numbers outside the root together
- Multiply all radicands together
- Simplify the final radical with a factor tree or _________________.

Ex: $6\sqrt{6} \cdot 4\sqrt{15}$

Example 1:
Find the product.

a.) $3\sqrt{2} \cdot \sqrt{18}$

b.) $5\sqrt{3}(2\sqrt{2} + 4\sqrt{5})$

c.) $2\sqrt{6}(3\sqrt{2} + 4\sqrt{2})$

d.) $8\sqrt{2}(2\sqrt{2} - 3\sqrt{6})$
Example 2: Find the area of the square below.

\[ 5\sqrt{3} \]

Example 3:

Find the product.

a.) \((2 - \sqrt{5})(2 + \sqrt{5})\)

b.) \((3 + \sqrt{2})(3 - \sqrt{2})\)

c.) \((1 + \sqrt{3})^2\)

d.) \((2 + \sqrt{5})^2\)
10.3 Day 2 Textbook Homework
10.3 Worksheet
Simplify the expressions.

1. $7\sqrt{7} - 2\sqrt{7}$
2. $3\sqrt{13} + 7\sqrt{13}$

3. $6\sqrt{5} - 2\sqrt{5} + 8\sqrt{5}$
4. $12\sqrt{r} - 9\sqrt{r}$

5. $9\sqrt{6a} - 11\sqrt{6a} + 4\sqrt{6a}$

Create like terms and simplify.

6. $\sqrt{44} - \sqrt{11}$
7. $\sqrt{28} + \sqrt{63}$

8. $4\sqrt{3} + 2\sqrt{12}$
9. $\sqrt{27} + \sqrt{48} + \sqrt{12}$

Use the Distributive Property to simplify.

10. $\sqrt{2}(\sqrt{8} + \sqrt{6})$
11. $3\sqrt{3}(2\sqrt{6} + 4\sqrt{10})$

12. $(4 + \sqrt{3})(4 - \sqrt{3})$
Radical Equations are equations that contain _______________________________. Like any equation, ___________________________(with the radical) and ________________________ to eliminate that radical.

Example 1: Solve for \(x\).

a) \(\sqrt{x} - 1 = 5\)  
b) \(\sqrt{x} - 3 + 8 = 6\)

c) \(12\sqrt{x} + 4 = 52\)  
d) \(\frac{\sqrt{x} + 2}{3} = 4\)

Example 2: The equation \(v = \sqrt{2.5r}\) represents the max velocity that a car can travel safely on an unbanked curve, where \(v\) is the max velocity in miles per hour and \(r\) is the radius of the turn in feet. If a road is designed for a maximum speed of 65 miles per hour, what is the radius of the turn?
Example 3: The equation $r = \frac{\sqrt{A}}{\pi}$ represents the radius of a circle with $r$ being the radius in meters and $A$ being the area measured in square meters. What is the area of a circle with a radius of 10 meters?
10.4 Day 1 Textbook Homework
Warm-Up:
Solve:
\[ \sqrt{x - 5} = 2\sqrt{3} \]

Extraneous Solutions:
When solving radical equations and having to square both sides, sometimes the answers you come up with aren’t solutions of the original equation when you check your answers. These are called ________________.

**You must check all your solutions to verify they are truly accurate answers**

Example 1: \[ \sqrt{x + 5} = x + 3 \]

Example 2: \[ \sqrt{10 - x} = x + 2 \]
10.4 Day 2 Textbook Homework
10.4 Worksheet

Solve each equation. Check your solution.

1. \( \sqrt{f} = 7 \)  
2. \( 2\sqrt{2} = \sqrt{u} \)

3. \( \sqrt{-5p} = 10 \) \( 2\sqrt{2} = \sqrt{u} \)  
4. \( 3\sqrt{5} = \sqrt{5n} \)

5. \( \sqrt{g} - 6 = 3 \)  
6. \( \sqrt{2t} - 1 = 5 \)

7. \( \sqrt{x + 4} - 2 = 1 \)  
8. \( \sqrt{4x - 4} - 4 = 0 \)

9. \( \frac{\sqrt{d}}{3} = 4 \)  
10. \( \sqrt{\frac{m}{3}} = 3 \)

11. \( x = \sqrt{x + 2} \)  
12. \( \sqrt{6p - 8} = p \)

13. \( \sqrt{x + 5} = x - 1 \)  
14. \( \sqrt{8 - d} = d - 8 \)
Graph each of the following functions. Then, state the domain and range.

1) \( y = \sqrt{x} + 1 \)

2) \( y = \sqrt{x} + 3 \)

3) \( y = -2 \sqrt{x} - 2 - 2 \)

Simplify each expression.

4) \( 3 \sqrt{50} - 2 \sqrt{72} + \sqrt{24} \)

5) \( 3 \sqrt{12} + \sqrt{27} - 2 \sqrt{20} \)

6) \( 3 \sqrt{12} \cdot 4 \sqrt{8} \)

7) \( \sqrt{2} (\sqrt{6} + 3 \sqrt{2}) \)

8) \( (\sqrt{7} - 2 \sqrt{10}) (4 \sqrt{5} + \sqrt{14}) \)

9) \( (3 - \sqrt{7})^2 \)

10) Find the perimeter of a rectangle with a width of \( 6 \sqrt{7} + 4 \sqrt{3} \) and a length of \( 3 \sqrt{3} - 5 \sqrt{7} \).
Solve each equation for $x$. Remember to check for extraneous solutions.

11) $3\sqrt{x - 1} + 4 = 7$

12) $\sqrt{2x} + 6 + 6 = 10$

13) $\sqrt{11x - 24} = x$

14) $\sqrt{5x + 39} = x + 3$
10.1, 10.3, 10.4 Quiz Day Warm-up

1. Simplify: \((\sqrt{3} - 4\sqrt{6})(2\sqrt{6} + \sqrt{2})\)

2. Solve for \(x\): \(\sqrt{13x - 10} = x + 2\)
Algebra 1
11.2 Radical Functions
Day 1

Warm-Up:
Solve:
\[ \sqrt{4x - 3} = 6 - x \]

Rational Functions are in the form \( y = \frac{p}{q} \), where \( p \) and \( q \) are polynomials and \( q \neq 0 \)

Rational Functions

Parent Function: ________________

Type of graph: ________________

Domain: ______

Range: ______

The equation above has a domain where \( x \neq 0 \). This happens because we are not allowed to divide anything by zero. Any and all values of \( x \) that would make the denominator of the function equal 0 is known as an excluded value.

Example 1: Find the excluded value of the functions.

a) \( y = \frac{-6}{x} \)

b) \( f(x) = \frac{12}{2x-5} \)

c) \( y = \frac{x}{x+13} \)

Look back at the graph at the top of the page. When we made our hyperbola, the two curves we graphed got very close to the line \( x = 0 \) and \( y = 0 \) but never crossed or touched those two lines. These “boundary” lines are called asymptotes.

Any basic function in the form \( f(x) = \frac{a}{x} \) (where \( a \) is a constant), there will always be the same asymptotes, \( x = 0 \) and \( y = 0 \).
More complex rational functions still have a vertical and a horizontal asymptote but one or both will not be at zero.

Rational functions in the form \( f(x) = \frac{a}{x-b} + c \; (a \neq 0) \) has a vertical asymptote for the value of \( x \) that makes the denominator zero.

- ______ is the vertical asymptote
- ______ is the horizontal asymptote
- Domain is _______________________
- Range is _______________________

Example 2: Find the asymptotes, domain, and range.

a.) \( y = \frac{-4}{x+2} \)  
   b.) \( y = \frac{3}{x} - 1 \)

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c.) \( y = \frac{3}{x-1} + 2 \)  
   d.) \( y = \frac{2}{x+1} - 5 \)

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11.2 Day 1 Textbook Homework
Warm-Up:
Find the asymptotes, domain, and range.

\[ y = \frac{3}{x - 4} - 6 \]

VA: _______  D: _______

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Steps to Graph a Rational Function

Step 1: Identify the two asymptotes and graph them as dashed lines

Step 2: Make two tables of values
- one table has values of \( x \) __________________________.
- one table has values of \( x \) __________________________.

Step 3: Plot both sets of points to create your ________________.

Step 4: Identify the domain and range.

Example 2: Graph the function, \( f(x) = \frac{1}{x+3} - 2 \). Identify the domain, range and asymptotes.

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Example 3: Graph the function, \( f(x) = \frac{1}{x-2} \). Identify the domain, range and asymptotes.

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Example 4: Graph the function \( f(x) = \frac{-3}{x} + 3 \). Identify the domain, range and asymptotes.

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11.2 Day 2 Textbook Homework

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Possible function: ________________________
11.2 Worksheet
State the excluded value for each function.

1. \( y = \frac{-1}{x} \)

2. \( y = \frac{3}{2x + 7} \)

3. \( y = \frac{2x}{x - 5} \)

Identify the asymptotes of each function. Then graph the function.

4. \( y = \frac{1}{x} \)

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6. \( y = \frac{2}{x - 1} \)

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7. \( y = \frac{2}{x + 2} \)

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8. \( y = \frac{1}{x - 3} + 2 \)

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9. \( y = \frac{2}{x + 1} - 1 \)

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10. **AIR TRAVEL** Denver, Colorado, is located approximately 1000 miles from Indianapolis, Indiana. The average speed of a plane traveling between the two cities is given by \( y = \frac{1000}{x} \), where \( x \) is the total flight time. Graph the function.
Algebra 1
11.8 Radical Equations
Day 1

Warm-Up:
Which is the equation for the graph shown?

a.) \( y = \frac{1}{x} - 1 \)
b.) \( y = \frac{1}{x - 1} \)
c.) \( y = \frac{-1}{x} + 1 \)
d.) \( y = \frac{-1}{x + 1} \)
e.) \( y = \frac{1}{x - 1} - 1 \)

__________________________

__________________________ are equations with one or more rational expressions.

Solving a rational equation can be done one of two ways depending on the location of the rational expressions.

The equation is set up like a proportion!
(one rational expression on each side of the equal sign)

USE CROSS MULTIPLYING TO SOLVE!

Example 1: Solve for x.

\[
\begin{align*}
a) \quad & \frac{x}{4} = \frac{2}{8} \\
b) \quad & \frac{3}{x + 4} = \frac{6}{10}
\end{align*}
\]

Example 2: Solve for x.

\[
\begin{align*}
a) \quad & \frac{5}{x - 2} = \frac{3}{x} \\
b) \quad & \frac{x}{9} = \frac{3}{x}
\end{align*}
\]
Example 3: Solve for \( x \).

\[
\frac{x}{5} = \frac{1}{x - 4}
\]

Extra Examples:
Solve for \( x \).

A. \[
\frac{14}{x+4} = \frac{x+1}{x-1}
\]

B. \[
\frac{x-2}{x+6} = \frac{x}{2}
\]

C. \[
\frac{x-4}{x-2} = \frac{1}{x-4}
\]
11.8 Day 1 Textbook Homework
Warm-Up:
Solve for n.
\[
\frac{1}{n - 2} = \frac{n}{8}
\]

Is the following an example of a proportion that we can use cross multiplication to solve for x?
\[
\frac{3}{x - 2} + \frac{7}{x} = \frac{10}{x - 3}
\]

How would you complete the following problem without a calculator? How could you solve this equation using the properties of proportions we just learned?
\[
\frac{1}{8} - \frac{1}{12}
\]
\[
\frac{1}{3} + \frac{5}{6} = \frac{x}{2}
\]

Today we will learn about how to find common denominators of rational expressions so that we can solve rational equations in which cross multiplication is not an option.

Example 1: Find the least common multiple of the following numbers.

a) 2, 6, 18
   b) 4, 12, 16
   c) 5, 10, 25
   d) 8, 12, 24

Example 2:
Find the LCD.

a.) \( \frac{x}{7}, \frac{7x}{4x} \)
   b.) \( \frac{8}{2x}, \frac{12x}{x^2} \)
   c.) \( \frac{3}{14x^3}, \frac{1}{2x} \)
   d.) \( \frac{5}{3x^3}, \frac{7}{6x} \)
When there is more than one fraction on each side of the equal sign you must:

1. Find the LCD (___________________________________)

2. Multiply every term __________________________.

3. __________________ each term

4. You should find you no longer have ____________________________ and can solve the equation!

5. Check for ______________________________ by plugging your solution(s) into the original equation to _______________________________________.

Example 3: Solve for x. Check your solution.

a) \( \frac{x}{3} - \frac{2}{6} = \frac{12}{9} \)

b) \( \frac{5 - 2x}{2} - \frac{4x + 3}{6} = \frac{7x + 2}{6} \)

Example 4: Solve for the variable. Check for extraneous solutions.

a) \( \frac{m + 4}{m} + \frac{m}{3} = \frac{m}{3} \)

b) \( \frac{1}{3} - \frac{2}{3x} = \frac{1}{x} \)

c) \( \frac{1}{x^2} = \frac{x - 1}{x} + \frac{1}{x} \)

d) \( \frac{1}{2} = \frac{x^2 - 7x + 10}{4x} - \frac{1}{2x} \)
11.8 Day 2 Homework

Find the least common denominator (LCD) of the rational expressions.

1) \( \frac{x}{5}, \frac{7x}{4} \)  
2) \( \frac{8}{2x}, \frac{12x}{x^2} \)  
3) \( \frac{5}{2x}, \frac{7}{4x} \)

Solve each rational expression. Check for extraneous solutions.

4) \( \frac{3}{5} - \frac{2x}{15} = \frac{x}{10} \)  
5) \( \frac{1}{2} + \frac{2}{x} = \frac{1}{x} \)

6) \( \frac{1}{2m^2} = \frac{1}{m} - \frac{1}{2} \)  
7) \( \frac{k+4}{4} + \frac{k-1}{4} = \frac{k+4}{4k} \)

8) \( \frac{4}{x} + \frac{x-2}{2x} = x \)  
9) \( \frac{12}{x} + \frac{3}{4} = \frac{3}{2} \)
Algebra 1  
11.8 Radical Equations  
Day 3  

**Warm-Up:**  
Solve. Check for extraneous solutions.

\[
\frac{3m}{2} - \frac{1}{4} = \frac{10m}{8}
\]

Example 1:  
Find the LCD.  
(a) \(\frac{3x}{x+1}, \frac{11}{x}\)  
(b) \(\frac{4}{x+2}, \frac{-2}{3x+2}\)  
(c) \(\frac{1}{5x+10}, \frac{3}{x+2}\)  
(d) \(\frac{2}{2x-1}, \frac{5}{8x-4}\)  
(e) \(\frac{2x+1}{x+1}, \frac{x-1}{x^2+4x+3}\)  
(f) \(\frac{12}{x^2-16}, \frac{-3}{x-4}\)

Using a Common Denominator to make all terms combinable.  

TO SOLVE, FIND THE LCD AND MULTIPLY IT BY EACH SIDE OF THE EQUATION  
- If done correctly, all the denominators in the problem should cancel out  
- Be sure to check your answers for extraneous solutions

Example 2: Solve for \(q\).  
\[
\frac{2q - 1}{6} - \frac{q}{3} = \frac{q + 4}{18}
\]
Example 3: Solve for $d$.
\[
\frac{d - 3}{d} - \frac{d - 4}{d - 2} = \frac{1}{d}
\]

**Be sure to factor each denominator so the LCD you find is truly the lowest CD.**

Example 4: Solve for $t$.
\[
\frac{3t}{3t - 3} - \frac{1}{t - 1} = 1
\]

Example 5: Solve for $p$.
\[
\frac{2p}{p - 2} + \frac{p + 2}{p^2 - 4} = 1
\]

Extra Practice:

A. \[
\frac{1}{z+1} - \frac{6-z}{6z} = 0
\]

B. \[
\frac{n+2}{n} + \frac{n+5}{n+3} = \frac{1}{n}
\]

C. \[
\frac{2}{m+2} - \frac{m+2}{m-2} = \frac{7}{3}
\]

D. \[
\frac{x+7}{x^2-9} - \frac{x}{x+3} = 1
\]

E. \[
\frac{2n}{n-4} - \frac{n+6}{n^2-16} = 1
\]
11.8 Worksheet
Solve for the missing variable. Be sure to check for extraneous solutions.

1. \[ \frac{5}{c} = \frac{2}{c + 3} \]

2. \[ \frac{3}{q} = \frac{5}{q + 4} \]

3. \[ \frac{7}{m + 1} = \frac{12}{m + 2} \]

4. \[ \frac{3}{x + 2} = \frac{5}{x + 8} \]

5. \[ \frac{3m}{2} - \frac{1}{4} = \frac{10m}{8} \]

6. \[ \frac{7g}{9} + \frac{1}{3} = \frac{5g}{6} \]

7. \[ \frac{c + 2}{c} + \frac{c + 3}{c} = 7 \]

8. \[ \frac{m - 4}{m} = \frac{m - 11}{m + 4} = \frac{1}{m} \]

9. \[ \frac{r + 3}{r - 1} - \frac{r}{r - 3} = 0 \]

10. \[ \frac{-2}{x + 1} + \frac{2}{x} = 1 \]

11. ACTIVISM Maury and Tyra are making phone calls to state representatives’ offices to lobby for an issue. Maury can call all 120 state representatives in 10 hours. Tyra can call all 120 state representatives in 8 hours. How long would it take them to call all 120 state representatives together?
11.8 Extra Practice

Solve each equation. State any extraneous solutions.

1. \( \frac{5}{n + 2} = \frac{7}{n + 6} \)
2. \( \frac{x}{x - 5} = \frac{x + 4}{x - 6} \)
3. \( \frac{k + 5}{k} = \frac{k - 1}{k + 9} \)

4. \( \frac{2h}{h - 1} = \frac{2h + 1}{h + 2} \)
5. \( \frac{4y + 1}{2} = \frac{5y}{6} \)
6. \( \frac{y - 2}{4} - \frac{y + 2}{5} = -1 \)

7. \( \frac{2q - 1}{6} - \frac{q}{3} = \frac{q + 4}{18} \)
8. \( \frac{5}{p - 1} - \frac{3}{p + 2} = 0 \)
9. \( \frac{3t}{3t - 3} - \frac{1}{9t + 3} = 1 \)

10. \( \frac{4x}{2x + 1} - \frac{2x}{2x + 3} = 1 \)
11. \( \frac{d - 3}{d} - \frac{d - 4}{d - 2} = \frac{1}{d} \)
12. \( \frac{3y - 2}{y - 2} + \frac{y^2}{2 - y} = -3 \)

13. PUBLISHING Tracey and Alan publish a 10-page independent newspaper once a month. At production, Alan usually spends 6 hours on the layout of the paper. When Tracey helps, layout takes 3 hours and 20 minutes.

a. Write an equation that could be used to determine how long it would take Tracey to do the layout by herself.

b. How long would it take Tracey to do the job alone?

14. TRAVEL Emilio made arrangements to have Lynda pick him up from an auto repair shop after he dropped his car off. He called Lynda to tell her he would start walking and to look for him on the way. Emilio and Lynda live 10 miles from the auto shop. It takes Emilio \( 2 \frac{1}{4} \) hours to walk the distance and Lynda 15 minutes to drive the distance.

a. If Emilio and Lynda leave at the same time, when should Lynda expect to spot Emilio on the road?

b. How far will Emilio have walked when Lynda picks him up?