

Algebra 2 Trig
Unit 3 Review for Test

Name: Key
Date:

I. Direct and inverse variation.

1. The variables x and y vary directly. Use the given values to find an equation relating x and y . Then find y when $x = 1$.

a. $x = -3$ and $y = 4$

b. $x = \frac{1}{3}$ and $y = \frac{1}{6}$

$-4/3$

$\frac{1}{2}$

2. The variables x and y vary inversely. Use the given values to find an equation relating x and y . Then find x when $y = -3$.

a. $x = 3$ and $y = 7$

b. $x = \frac{1}{2}$ and $y = -2$

-7

$\frac{1}{3}$

II. Multiply or divide.

3. $(x^2 + 10x - 24) \div \frac{x^2 - 144}{3x - 36}$

4.
$$\frac{x+y}{x-y} \cdot \frac{x^2+2xy+y^2}{x^2-2xy+y^2}$$

$3(x-2)$

$\frac{x-y}{x+y}$

5. $\frac{2x^3 - 12x^2}{x^2 - 4x - 12} \div \frac{8x^3 + 24x^2}{x^2 + 9x + 18}$

6. $\frac{7x^2 - 21x}{x^2 - 2x - 35} \div \frac{x^2}{x-7}$

$\frac{x+6}{4(x+2)}$

$\frac{7(x-3)}{x(x+5)}$

7. $\frac{21x^{10}y^5}{5x^2} \cdot \frac{x^3}{35y^4}$

8. $(x^2 + 7x - 30) \div \frac{x^2 + 5x - 24}{x+2} \cdot \frac{x+2}{x^2 + 3x + 2}$

$\frac{3x^{11}y}{25}$

$\frac{(x+10)(x+2)}{(x+8)(x+1)}$

III. Add or subtract.

9. $\frac{x}{x^2 - 9} + \frac{3}{x(x-3)}$

$$\begin{array}{r} x^2 + 3x + 9 \\ \hline x(x+3)(x-3) \end{array}$$

11. $\frac{7}{x-2} + \frac{x}{x-2}$

$$\begin{array}{r} x+7 \\ \hline x-2 \end{array}$$

15. $\frac{x}{x^2 + x - 2} + \frac{1}{x+2}$

$$\begin{array}{r} 2x-1 \\ \hline (x+2)(x-1) \end{array}$$

IV. Solve.

17. $\frac{1}{x+2} + \frac{1}{x+2} = \frac{4}{x^2 - 4}$

$$\begin{array}{r} 5 \\ \hline \end{array}$$

19. $\frac{5x}{x-1} - 2 = \frac{14}{x^2 - 1}$

$$\begin{array}{r} 3, -3 \\ \hline \end{array}$$

21. $\frac{1}{x-5} + \frac{1}{x+5} = \frac{x+3}{x^2 - 25}$

$$\begin{array}{r} 3 \\ \hline \end{array}$$

10. $\frac{x}{x^2 - x - 30} - \frac{1}{x+5}$

$$\begin{array}{r} 6 \\ \hline (x-6)(x+5) \end{array}$$

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

$$\begin{array}{r} 8x^2 + 10x - 6 \\ \hline x^2(x+3) \end{array}$$

16. $\frac{x+2}{x-1} - \frac{2}{x+6} = \frac{14}{x^2 + 5x - 6}$

$$\begin{array}{r} x \\ \hline x-1 \end{array}$$

18. $\frac{4}{x} - \frac{1}{x+2} = \frac{2}{x}$

$$\begin{array}{r} 4 \\ \hline \end{array}$$

20. $\frac{3}{x-1} - 6 = \frac{5x}{x-1}$

$$\begin{array}{r} 9/10 \\ \hline \end{array}$$

22. $\frac{2x-4}{x-4} = \frac{4}{x-4}$

$$\begin{array}{r} \phi \\ \hline \end{array}$$

23. **Population Density** The population density in a large city is related to

the distance from the center of the city. It can be modeled by

$$D = \frac{5000x}{x^2 + 36}$$

where D is the population density (in people per square mile) and x is the distance (in miles) from the center of the city. Find the areas where the population density is 400 people per square mile.

80
80
80
 $\frac{9}{2}$
miles

$$1. \text{ a.) } y = kx \quad y = -\frac{4}{3}x \quad \text{b.) } 3 \cdot \frac{1}{6} = \frac{1}{3}k \cdot 3 \quad y = \frac{1}{2}x$$

$$4 = -3k \quad y = -\frac{4}{3}(1)$$

$$k = -\frac{4}{3} \quad K = \frac{1}{2} \quad y = \frac{1}{2}(1)$$

$y = -\frac{4}{3}$

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

$$2. \text{ a.) } y = \frac{k}{x} \quad y = \frac{21}{x} \quad \text{b.) } -2 = \frac{k}{-1} \quad y = \frac{-1}{x}$$

$$7 = \frac{k}{3} \quad -3 = \frac{21}{x} \quad K = -1 \quad -3 = \frac{-1}{x}$$

$$K = 21 \quad -3x = 21 \quad -3x = -1$$

$x = -7$

$x = \frac{1}{3}$

$$3. \quad (\cancel{x+12})(\cancel{x-2}) \cdot \frac{3(\cancel{x+12})}{(\cancel{x+12})(\cancel{x-12})} = [3(x-2)]$$

$$4. \quad \frac{x+y}{x-y} \cdot \frac{(x-y)(x+y)}{(x+y)(x+y)} = \boxed{\frac{(x-y)}{(x+y)}}$$

$$5. \quad \frac{2x^2(x-6)}{(x-6)(x+2)} \cdot \frac{(x+3)(x+6)}{8x^2(x+3)} = \boxed{\frac{(x+6)}{4(x+2)}}$$

$$6. \frac{7x(x-3)}{(x-7)(x+5)} \cdot \frac{x-7}{x^2} = \boxed{\frac{7(x-3)}{x(x+5)}}$$

$$7. \frac{21x^{10}y^5}{5x^2} \cdot \frac{x^3}{25y^4} = \boxed{\frac{3x^{11}}{25y}}$$

$$8. \frac{(x+10)(x-3)}{(x+8)(x-3)} \cdot \frac{x+2}{(x+2)(x+1)} = \boxed{\frac{(x+10)(x+2)}{(x+8)(x+1)}}$$

$$9. \frac{x^2}{(x+3)(x-3)} + \frac{3 \cdot (x+3)}{x(x-3)} = \boxed{\frac{x^2 + 3x + 9}{x(x+3)(x-3)}}$$

$$10. \frac{x \cdot 1}{(x-6)(x+5)} + \frac{-1 \cdot (x-6)}{x+5} = \boxed{\frac{6}{(x-6)(x+5)}}$$

$$11. \frac{7}{x-2} + \frac{x}{x-2} = \boxed{\frac{x+7}{x-2}}$$

$$12. \frac{4}{x} + \frac{-2}{x^2} + \frac{4 \cdot x}{x+3} = \boxed{\frac{8x^2 + 10x - 6}{x^2(x+3)}}$$

$$13. \frac{x}{(x+2)(x-1)} + \frac{1 \cdot (x-1)}{x+2} = \boxed{\frac{2x-1}{(x+2)(x-1)}}$$

$$14. \frac{x^2 + 8x + 12}{x+2} + \frac{-2x+2}{x+6} + \frac{-14}{(x+6)(x-1)} = \frac{x^2 + 6x}{(x+6)(x-1)}$$

$$= \frac{x(x+6)}{(x+6)(x-1)}$$

$$= \boxed{\frac{x}{x-1}}$$

$$17. \left(\frac{1}{x+2} + \frac{1}{x-2} = \frac{4}{(x+2)(x-2)} \right) (x+2)(x-2)$$

$$x+2 + x-2 = 4$$

$$2x = 4$$

$$\boxed{x = 4}$$

$$18. \left(\frac{4}{x} + \frac{-1}{x+2} = \frac{2}{x} \right) \times (x+2)$$

$$4x + 8 - x = 2x + 4$$

$$3x + 8 = 2x + 4$$

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

$$19. \left(\frac{5x}{x-1} + \frac{-2}{1} = \frac{14}{(x+1)(x-1)} \right) (x+1)(x-1)$$

$$5x^2 + 5x - 2x^2 + 2 = 14$$

$$3x^2 + 5x - 12 = 0$$

$$(3x-4)(x+3) = 0$$

$$\boxed{x = \frac{4}{3}} \quad \boxed{x = -3}$$

$$20. \left(\frac{3}{x-1} + \frac{-6}{1} = \frac{5x}{x-1} \right) (x-1)$$

$$3 - 6x + 6 = 5x$$

$$9 = 11x$$

$$\boxed{x = \frac{9}{11}}$$

$$21. \left(\frac{1}{x-5} + \frac{1}{x+5} = \frac{x+3}{(x+5)(x-5)} \right) (x+5)(x-5)$$

$$x+5 + x-5 = x+3$$

$$2x = x+3$$

$$\boxed{x=3}$$

$$22. \left(\frac{2x-4}{x-4} = \frac{4}{x-4} \right) (x-4)$$

$$2x-4 = 4$$

$$2x = 8$$

$$\boxed{\cancel{x=4}} \quad \emptyset$$

$$23. \frac{400}{1} = \frac{5000x}{x^2 + 36}$$

$$400x^2 + 14400 = 5000x$$

$$400x^2 - 5000x + 14400 = 0$$

$$2x^2 - 25x + 72 = 0$$

$$(2x-9)(x-8) = 0$$

$$x = \frac{9}{2} \quad x = 8$$