Advanced Algebra
Unit 8 PRACTICE SWIG

Name: Key
Hour: _____ **Date:** _____

DIRECTIONS: You must show your work to receive full credit.

8.A. Classify an equation as direct, inverse or joint variation

Direct: $y = kx$ Joint: $y = kxz$ Inverse: $xy = k$ or $y = \frac{k}{x}$

1. State whether each equation represents *direct*, *joint*, or *inverse* variation. Then state *k*, the constant of variation.

a) $y = 5xz$ b) $v = 4w$ c) $xy = \frac{1}{3}$ d) $y = \frac{7}{x}$ e) $0.5 = \frac{m}{n}$

Joint $k=5$ Direct $k=4$ Inverse $k=\frac{1}{3}$ Inverse $k=7$ Direct $k=0.5$

8.B. Create equations to solve direct, inverse or joint variation problems.

2. The variable *y* varies directly with *x*. If *y* = -16 when *x* = 4, find *x* when *y* = 24.

$\frac{y_1}{x_1} = \frac{y_2}{x_2} \rightarrow \frac{-16}{4} = \frac{24}{x} \rightarrow -16x = 4 \cdot 24$

$\frac{-16x}{-16} = \frac{96}{-16}$ $x = -6$

3. If *y* varies directly as *x* and y = 18 when *x* = 15, find *y* when *x* = 20.

$\frac{18}{15} = \frac{y}{20} \rightarrow 18 \cdot 20 = 15y$

$\frac{360}{15} = \frac{15y}{15}$ $24 = y$

4. The variable *y* varies inversely with *x*. If *y* = 2 when *x* = 8, find *x* when *y* = 32.

$x_1y_1 = x_2y_2 \rightarrow (2)(8) = x \cdot 32$

$\frac{16}{32} = \frac{32x}{32}$ $0.5 = x$

5. If *y* varies inversely as *x* and *y* = -14 when *x* = 12, find *x* when *y* = 21.

$(12)(-14) = x \cdot 21$

$\frac{-168}{21} = \frac{21x}{21}$ $-8 = x$

6. The variable *y* varies jointly with *x* and *z*. If *y* = 24 when *z* = 2 and *x* = 1, find *y* when *x* = 12 and *z* = 2.

$\frac{y_1}{x_1z_1} = \frac{y_2}{x_2z_2} \rightarrow \frac{24}{(2)(1)} = \frac{y}{(12)(2)} \rightarrow \frac{24}{2} = \frac{y}{24} \rightarrow \frac{2y}{2} = \frac{576}{2}$

$y = 288$

7. Suppose *y* varies jointly as *x* and *z*. Find *y* when *x* = 9 and *z* =-5, if *y* = -90 when z =15 and *x* = -6.

$\frac{-90}{(-6)(15)} = \frac{y}{(9)(-5)} \rightarrow \frac{-90}{-90} = \frac{y}{-45} \rightarrow (-90)(-45) = -90y$

$\frac{4050}{-90} = \frac{-90y}{-90}$ $-45 = y$

8.C. Perform operations and simplify rational expressions.

Simplify each expression.

$x^2 - 8x = x \cdot x - 8 \cdot x = x(x-8)$ pull out

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

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

FLIP

$x^2 - y^2$ is like $x^2 + 0x - y^2$

$-y^2$

$-y \cdot y$

$(x-y)(x+y)$

10. $\frac{x^2+2x\boxed{-3}}{x^2+4x+4} \cdot \frac{x^2-4}{x^2-3x+2} = \frac{(x+3)(x-1)}{(x+2)(x+2)} \cdot \frac{(x-2)(x+2)}{(x-1)(x-2)} = \frac{x+3}{x+2}$

$\boxed{-3}$: $3 \cdot -1$; 4: $2 \cdot 2$; -4: $-2 \cdot 2$; 2: $-1 \cdot -2$

11. $\frac{3x+6}{40x^2} \div \frac{3x^2}{24} = \frac{3(x+2)}{2 \cdot 2 \cdot 2 \cdot 5 \cdot x \cdot x} \cdot \frac{2 \cdot 2 \cdot 2 \cdot 3}{3 \cdot x \cdot x} = \frac{3(x+2)}{5x \cdot x \cdot x \cdot x} = \frac{3(x+2)}{5x^4}$

FLIP

$3x+6$

$= 3 \cdot x + 3 \cdot 2$

$= 3(x+2)$

40: 2, 20, 2, 10, 2, 5

24: 2, 12, 2, 6, 2, 3

12. $\frac{x-3}{x-1} + \frac{6}{5x-5} = \frac{x-3}{x-1} + \frac{6}{5(x-1)} = \frac{5 \cdot (x-3)}{5(x-1)} + \frac{6}{5(x-1)}$

missing 5 from here

need common denominator

$= \frac{5x-15+6}{5(x-1)} = \frac{5x-9}{5(x-1)}$

$5x - 1 \cdot 5$

$5(x-1)$

13. $\frac{3}{2x} - \frac{1}{6x} - \frac{2}{4x} = \frac{(4 \cdot 6) \cdot 3}{(4 \cdot 6) \cdot 2x} - \frac{(2 \cdot 4) \cdot 1}{(2 \cdot 4) \cdot 6x} - \frac{(2 \cdot 6) \cdot 2}{(2 \cdot 6) \cdot 4x}$

$= \frac{72}{48x} - \frac{8}{48x} - \frac{24}{48x} = \frac{72-8-24}{48x} = \frac{40}{48x} = \frac{5}{6x}$

14. $\frac{6}{d^2+4d+4} + \frac{5}{d+2} = \frac{6}{(d+2)(d+2)} + \frac{5}{d+2}$

4: $2 \cdot 2$

$= \frac{6}{(d+2)(d+2)} + \frac{(d+2)}{(d+2)} \cdot \frac{5}{(d+2)} = \frac{6+5d+10}{(d+2)(d+2)} = \frac{5d+16}{(d+2)(d+2)}$

8.D. Understand the relationship between a rational function and its graph.

15. For each function, determine the equations of any vertical asymptotes and the values of x for any holes in the graph.

A) $f(x) = \dfrac{3}{(x-5)(x+2)}$

Nothing can be factored out so, we have 2 vertical asymptotes.

$x-5=0$
$+5 \quad +5$
$x=5$

and

$x+2=0$
$-2 \quad -2$
$x=-2$

B) $f(x) = \dfrac{x^2-9}{x+3} = \dfrac{(x-3)\cancel{(x+3)}}{\cancel{(x+3)}} = x-3$

$-3+3$

-9
$-3 \cdot 3$

crossed out, so 1 hole at -3

No vertical asymptotes

8.E. Solve rational equations.

16. Solve each equation. Check for extraneous solutions.

A) $\dfrac{4}{x-1} = 2 - \dfrac{x}{x-1}$

multiply every term by $(x-1)$

$\dfrac{4}{\cancel{x-1}} \cdot \cancel{(x-1)} = 2 \cdot (x-1) - \dfrac{x}{\cancel{x-1}} \cdot \cancel{(x-1)}$

$4 = 2(x-1) - x$

$4 = 2x - 2 - x$

$4 = x - 2$
$+2 \quad +2$

$\rightarrow 6 = x$

CHECK:

$\dfrac{4}{6-1} = 2 - \dfrac{6}{6-1}$

$\dfrac{4}{5} = 2 - \dfrac{6}{5}$

$\dfrac{4}{5} = \dfrac{4}{5}$ ✓

B) $\dfrac{4}{x-2} = \dfrac{1}{x-3}$

cross multiply

$4(x-3) = 1(x-2)$

$4x - 12 = x - 2$
$-x \quad -x$

$3x - 12 = -2$
$+12 \quad +12$

$\dfrac{3x}{3} = \dfrac{10}{3}$

$x = \dfrac{10}{3}$

CHECK:

$\dfrac{4}{\frac{10}{3} - 2} = \dfrac{1}{\frac{10}{3} - 3}$

$\dfrac{4}{\frac{4}{3}} = \dfrac{1}{\frac{1}{3}}$

$3 = 3$ ✓