Chapter 9 Practice Test

Adv Algebra

Name KEY Period

1. *y* varies directly with *x*, and *y* = 3 when *x* = 12.

   a) Write the function that models this direct variation. 1a. $y = \frac{1}{4}x$ or $y = \frac{x}{4}$

   $y = k \cdot x$ $\quad \frac{(3)}{12} = \frac{k(12)}{12}$ $\quad k = \frac{1}{4}$

   b) Find *y* when *x* = 6. 1b. $y = \frac{3}{2}$

   $y = \frac{1}{4}(6)$ $\quad y = \frac{6}{4} \rightarrow \frac{3}{2}$

2. *y* varies inversely with *x*, and *y* = 3 when *x* = 12.

   a) Write the function that models this inverse variation. 2a. $y = \frac{36}{x}$

   $y = \frac{k}{x}$ $\quad 12 \cdot (3) = \frac{k}{(12)} \cdot 12$ $\quad k = 36$

   b) Find *y* when *x* = 6. 2b. $y = 6$

   $y = \frac{36}{(6)}$ $\quad y = 6$

3. *z* varies directly with *x* and *y*, and *z* = 24 when *x* = 3 and *y* = 4.

   a) Write the function that models this joint variation. 3a. $z = 2xy$

   $z = k \cdot x \cdot y$ $\quad (24) = k \cdot (3) \cdot (4)$ $\quad \frac{24}{12} = \frac{12k}{12}$ $\quad k = 2$

   b) Find *z* when *x* = 6 and *y* = 5. 3b. $z = 60$

   $z = 2(6)(5)$

   $z = 60$

4. The mass *m* of an object varies directly with the kinetic energy *E* of the object and inversely with the square of the velocity *v* of the object. An object with a kinetic energy of 8 Joules and a velocity of 2 m/s has a mass of 4 kg.

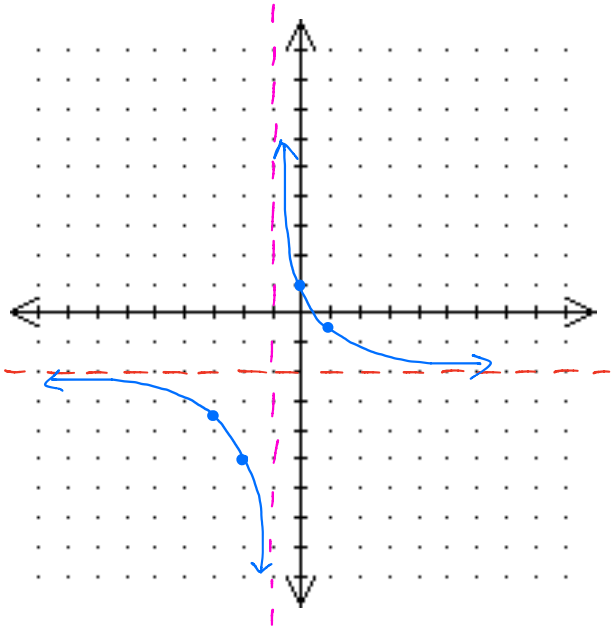
   a) Write a model for this variation. 4a. $m = \frac{2E}{v^2}$

   $m = \frac{k \cdot E}{v^2}$ $\quad 4 \cdot (4) = \frac{(8)k}{(2)^2} \cdot 4$ $\quad \frac{16}{8} = \frac{8k}{8}$ $\quad k = 2$

   b) What is the mass, in kg, of an object with a kinetic energy of 50 Joules and a velocity of 5 m/s? 4b. $m = 4$ kg

   $m = \frac{2(50)}{(5)^2} = \frac{100}{25} = 4$

5. Draw the graph and asymptotes of the function $y = \frac{3}{x+1} - 2$.



$x \neq -1$

Domain: $(-\infty, -1) \cup (-1, \infty)$

x = all Real #'s except -1

Range: $(-\infty, -2) \cup (-2, \infty)$

y = all Real #'s except -2

Horizontal asymptote: $y = -2$

Vertical asymptote: $x = -1$

x	y
-3	$-3\frac{1}{2}$
-2	-5
-1	Undefined
0	1
1	$-\frac{1}{2}$

For questions 6 – 9, simplify completely and state any restrictions on the variable. ***Show work or receive no credit.***

6. $\frac{3}{4x} + \frac{5}{12x}$

Must have a common denominator

LCD: $12x$

$\times \frac{3}{3}$

$\frac{9}{12x} + \frac{5}{12x} = \frac{14}{12x} = \frac{7}{6x}$

6. $\frac{7}{6x}$

Restrictions: $x \neq 0$

7. $\frac{x^2 + x - 3}{x^2 - 12x + 32} + \frac{3x}{x - 8}$

LCD: $(x-8)(x-4)$

Must have a common denominator

$\times \frac{(x-4)}{(x-4)}$

$\frac{x^2+x-3}{(x-8)(x-4)} + \frac{3x(x-4)}{(x-8)(x-4)}$

$\frac{x^2+x-3}{(x-8)(x-4)} + \frac{3x^2-12x}{(x-8)(x-4)}$

$\frac{4x^2-11x-3}{(x-8)(x-4)}$

7. $\frac{4x^2-11x-3}{(x-8)(x-4)}$

Restrictions: $x \neq 8, 4$

8. $\frac{x^2 + 6x + 9}{x^2 - 9}$

$\frac{(x+3)(x+3)}{(x+3)(x-3)} = \frac{x+3}{x-3}$

8. $\frac{x+3}{x-3}$

Restrictions: $x \neq 3, -3$

9. $\dfrac{x^2+8x+16}{x+2} \div \dfrac{x^2+6x+8}{x^2-4}$

Do not need a common denominator

$\dfrac{(x+4)(x+4)}{x+2} \cdot \dfrac{(x+4)(x+2)}{(x+2)(x-2)}$ Multiply by the Reciprocal

$\dfrac{(x+4)(x+4)}{x+2} \cdot \dfrac{(x+2)(x-2)}{(x+4)(x+2)}$

$\dfrac{(x+4)(x-2)}{(x+2)}$

9. $\dfrac{(x+4)(x-2)}{(x+2)}$

Restrictions: $x \neq -2, 2, -4$

Check all denominators

10. Simplify completely: $\dfrac{\frac{2}{x+2}}{\frac{1}{x+2}+\frac{2}{x}}$

LCD: $x(x+2)$

$\times \dfrac{(x+2)}{(x+2)} \quad \times \dfrac{x}{x}$

$\dfrac{2}{x+2}$

$\dfrac{1x}{x(x+2)} + \dfrac{2(x+2)}{x(x+2)}$

$\dfrac{2}{x+2}$

$\dfrac{1x}{x(x+2)} + \dfrac{2x+4}{x(x+2)}$

$\dfrac{\frac{2}{x+2}}{\frac{3x+4}{x(x+2)}} \rightarrow \dfrac{2}{x+2} \cdot \dfrac{x(x+2)}{3x+4} \rightarrow \dfrac{2x}{3x+4}$

10. $\dfrac{2x}{3x+4}$

Solve the following equations. Check each solution. ***Show work or receive no credit.***

Cannot Cross-Multiply. This is not a proportion yet.

11. $\dfrac{2}{x+1} + \dfrac{x}{x-1} = \dfrac{2}{x^2-1}$

LCD: $(x+1)(x-1)$

$(x+1)(x-1)$

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

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

$2x - 2 + x^2 + x = 2$

$x^2 + 3x - 2 = -2$

$x^2 + 3x - 4 = 0$

$(x+4)(x-1) = 0$

$x = -4$ $x = 1$

$x = -4$ ☆ $x = 1$ Extraneous

Check $x = -4$

$\dfrac{2}{(-4)+1} + \dfrac{-4}{(-4)-1} = \dfrac{2}{(-4)^2-1}$

$\dfrac{2}{-3} + \dfrac{-4}{-5} = \dfrac{2}{16-1}$

$-\dfrac{2}{3}\cdot\dfrac{5}{5} + \dfrac{4}{5}\cdot\dfrac{3}{3} = \dfrac{2}{15}$

$\dfrac{-10}{15} + \dfrac{12}{15} = \dfrac{2}{15}$

$\dfrac{2}{15} = \dfrac{2}{15}$ ✓

Check $x = 1$

$\dfrac{2}{(1)+1} + \dfrac{1}{(1)-1} = \dfrac{2}{(1)^2-1}$

$\dfrac{2}{0} + \dfrac{1}{0} = \dfrac{2}{0}$

Undefined

11. $x = -4$

Cannot Cross-Multiply. This is not a proportion yet.

12. $\frac{3x}{x+1} + \frac{6}{2x} = \frac{7}{x}$

LCD: $2x(x+1)$

$2x(x+1)\cdot\frac{3x}{x+1} + \frac{6}{2x}\cdot 2x(x+1) = \frac{7}{x}\cdot 2x(x+1)$

$2x(3x) + 6(x+1) = 7\cdot 2\cdot(x+1)$

$6x^2 + 6x + 6 = 14x + 14$

$-14x \quad -14 \quad -14x \quad -14$

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

$2(3x^2 - 4x - 4) = 0$

$2(3x+2)(x-2) = 0$

$x = -\frac{2}{3}$ ★ $\quad x = 2$ ★

12. $x = -\frac{2}{3}, 2$

13. $\frac{x}{2x-6} = \frac{2}{x-4}$ Proportion! Cross-multiply.

$x(x-4) = 2(2x-6)$

$x^2 - 4x = 4x - 12$

$-4x + 12 \quad -4x + 12$

$x^2 - 8x + 12 = 0$

$(x-6)(x-2) = 0$

$x = 6$ ★ $\quad x = 2$ ★

13. $x = 6 \quad x = 2$

Check $x=6$

$\frac{6}{2(6)-6} = \frac{2}{(6)-4}$

$\frac{6}{12-6} = \frac{2}{2}$

$\frac{6}{6} = 1$

$1 = 1$ ✓

Check $x=2$

$\frac{2}{2(2)-6} = \frac{2}{(2)-4}$

$\frac{2}{4-6} = \frac{2}{-2}$

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

$-1 = -1$ ✓

Cannot Cross-Multiply. This is not a proportion yet.

14. $2x\cdot\frac{4}{x} + \frac{5}{2}\cdot 2x = -\frac{11}{x}\cdot 2x$

LCD: $2x$

$2(4) + 5(x) = -11(2)$

$8 + 5x = -22$

$-8 \quad -8$

$\frac{5x}{5} = \frac{-30}{5}$

$x = -6$

Check:

$\frac{4}{(-6)} + \frac{5}{2} = \frac{-11}{(-6)}$

$\frac{2}{2}\cdot\frac{-2}{3} + \frac{5}{2}\cdot\frac{3}{3} = \frac{11}{6}$

$\frac{-4}{6} + \frac{15}{6} = \frac{11}{6}$

$\frac{11}{6} = \frac{11}{6}$ ✓

14. $x = -6$

15. Given the table of values, answer the following questions.

x	y
1	3
2	1.5
3	1

increasing ↓ ↑ decreasing

15a. Is the relationship between *x* and *y* a direct or inverse variation? Justify your answer.

$k = (1)(3) = 3$

$k = (2)(1.5) = 3$

$k = (3)(1) = 3$

15a. INVERSE. As the x-values increase, the y-values decrease. $k = 3$ ... common product.

15b. Write the function that models the data.

15b. $y = \frac{3}{x}$

$y = \frac{k}{x}$ inverse

$k = y\cdot x$