

Algebra II – Chapter 8

8.1: Model Inverse and Joint Variation

INVERSE VARIATION:
 $xy = k \quad k \neq 0$
 x and $y \rightarrow$ variables
 $k \rightarrow$ constant of inverse variation

$y = \# \text{ cookies} = ?$
 $x = \# \text{ days} = 2$
 $k = 6$

$\frac{y}{2} = \frac{6}{2}$
 $y = 3 \text{ cookies}$

- Remember that direct variation is $y = ax$
- Joint variable is when the quantity varies directly with the product of two or more variables. The formula is: $z = axy$. This reads “z varies jointly with x and y”.

1) Do these show direct variation, inverse variation, or neither?

- $3x = y$
- $xy = 0.75$
- $y = x - 5$

2) If x and y vary inversely, write an equation and find y when x=2

- $x = 4, y = 3$
- $x = 8, y = -1$

3) If z varies jointly with x and y, write an equation. Find z when x=-2 and y=5.

- $x = 1, y = 2, z = 7$
- $x = 4, y = -3, z = 24$

4) Write an equation:

- x varies inversely with y and directly with w
- p varies jointly with q and r and inversely with s

8.2: Graph Simple Rational Functions

Graph the function. State the domain and range:

1) $f(x) = -\frac{4}{x}$

2) $y = \frac{8}{x} - 5$

3) $y = \frac{1}{x-3} + 2$

4) $y = \frac{x-1}{x+3}$

5) $y = \frac{2x+1}{4x-2}$

6) $f(x) = \frac{-3x+2}{-x-1}$

8.3: Graph General Rational Functions

GRAPH CHARACTERISTICS

- ◉ x-intercepts are real zeros of $p(x)$ [top]
- ◉ Vertical asymptotes are at each real zero of $q(x)$ [bottom]
- ◉ At most one horizontal asymptote:
(m is degree of top, n is degree of bottom)
 - If $m < n$, at $y = 0$
 - If $m = n$, at $y = \frac{a_m}{b_n}$
(a_m and b_n are leading coefficients)
 - If $m > n$, no horizontal asymptote.

Graph the function. State the domain, range, identify x-intercept(s) and vertical and horizontal asymptote(s):

1) $y = \frac{4}{x^2+2}$

2) $y = \frac{3x^2}{x^2-1}$

3) $f(x) = \frac{x^2-5}{x^2+1}$

4) $y = \frac{x^2-2x-2}{x-4}$

8.4: Multiply and Divide Rational Expressions

$$\frac{ac}{bc} = \frac{a}{b}$$

Simplify, if possible:

$$1) \frac{2(x+1)}{(x+1)(x+3)}$$

$$2) \frac{40x+20}{10x+30}$$

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

$$4) \frac{x+4}{x^2-16}$$

$$5) \frac{x^2-2x-3}{x^2-x-6}$$

$$6) \frac{3x^5y^2}{8xy} \cdot \frac{6xy^2}{9x^3y}$$

$$7) \frac{2x^2-10x}{x^2-25} \cdot \frac{x+3}{2x^2}$$

$$8) \frac{4x}{5x-20} \div \frac{x^2-2x}{x^2-6x+8}$$

8.5: Add and Subtract Rational Expressions

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\frac{a}{c} - \frac{b}{c} = \frac{a-b}{c}$$

Practice:

$$1) \frac{7}{12x} - \frac{5}{12x}$$

$$2) \frac{2}{3x^2} + \frac{1}{3x^2}$$

$$3) \frac{4x}{x-2} - \frac{x}{x-2}$$

$$4) \frac{2x^2}{x^2+1} + \frac{2}{x^2+1}$$

$$5) \frac{3}{4x} - \frac{1}{7}$$

$$6) \frac{1}{3x^2} + \frac{x}{9x^2-12x}$$

8.6: Solve Rational Equations

For certain equations, you can use cross multiplication to solve.

$$1) \frac{3}{5x} = \frac{2}{x-7}$$

$$2) \frac{1}{2x+5} = \frac{x}{11x+8}$$

$$3) \frac{7}{2} + \frac{3}{x} = 3$$

$$4) \frac{2}{x} + \frac{4}{3} = 2$$

$$5) \frac{3}{2} + \frac{4}{x-1} = \frac{x+1}{x-1}$$