

Ch.8 Skills (47-72)

Name KEY

Advanced Algebra

47 Inverse, Joint and Combined Variation.

- 1) y varies inversely as x . If $y = 18$ when $x = 15$, write an inverse-variation equation and find y when x is 27.

$$y = \frac{k}{x} \quad 18 = \frac{k}{15} \quad k = 270$$

$$y = \frac{270}{27}$$

$$y = \frac{270}{x} \quad y = 27$$

- 2) y varies jointly as x and z . If $y = 24$ when $x = 2$ and $z = -4$, write a joint variation equation and find y when $x = -3$ and $z = -6$.

$$y = k(x)(z) \quad 24 = k(2)(-4) \quad k = -3$$

$$y = -3(-3)(-6)$$

$$y = -3(x)(z) \quad y = -54$$

- 3) z varies jointly as x and y and inversely as w . If $z = 6$ when $x = 12$, $y = -2$ and $w = 5$, write a combined variation equation and find z when $x = 7$, $y = 2$ and $w = 14$.

$$z = \frac{k(x)(y)}{(w)} \quad 6 = \frac{k(12)(-2)}{5} \rightarrow k = \frac{30}{-24} = -\frac{15}{12}$$

$$z = \frac{-15(x)(y)}{w}$$

$$z = \frac{-15(x)(y)}{12(w)}$$

$$z = -15$$

48 Graphing Rational Function.

Graph, Label all holes, asymptotes x -intercepts and y -intercepts.

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

VA $\rightarrow -2$
 HA $\rightarrow 2$
 Hole \rightarrow N/A
 x-int $\rightarrow 1$
 y-int $\rightarrow -1$

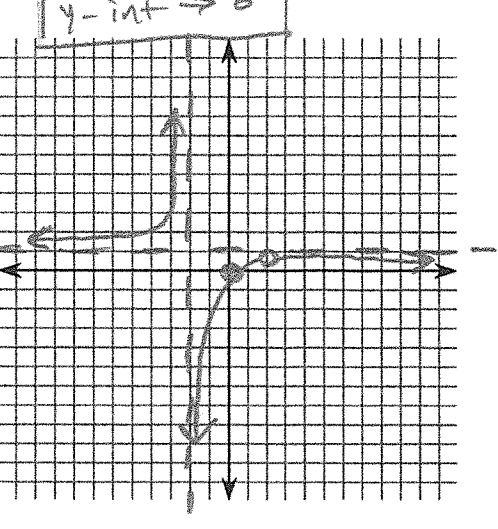
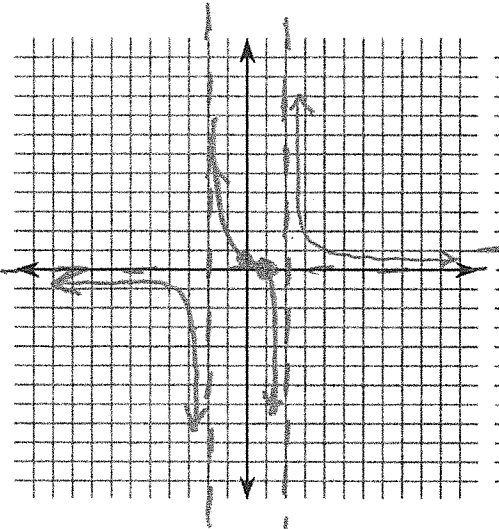
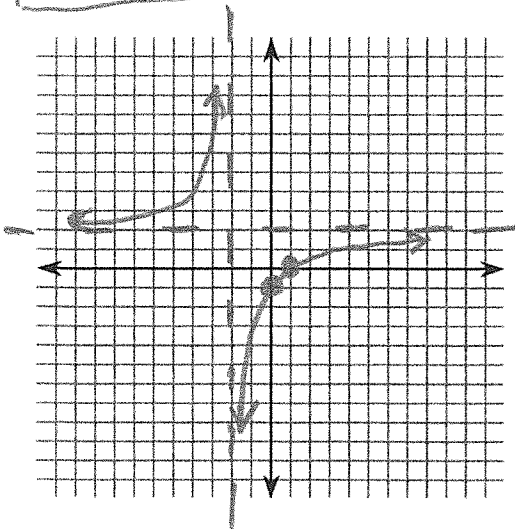
5) $f(x) = \frac{2x-2}{2x^2-8} = \frac{2(x-1)}{2(x-2)(x+2)}$

VA $\rightarrow 2, -2$
 HA $\rightarrow 0$
 Hole \rightarrow N/A
 x-int $\rightarrow 1$
 y-int $\rightarrow \frac{1}{4}$

$f(3) = \frac{4}{10} = \frac{2}{5}$
 $f(-3) = \frac{-8}{10}$

6) $f(x) = \frac{x^2-2x}{x^2-4} = \frac{x(x-2)}{(x-2)(x+2)}$

Hole $\rightarrow (2, \frac{1}{2})$
 VA $\rightarrow -2$
 HA $\rightarrow 1$
 x-int $\rightarrow 0$
 y-int $\rightarrow 0$



49 Multiplying & Dividing Rational Polynomials

Perform the indicated operation.

$$7) \frac{x^2 - 4}{x^2 + 2x + 1} \cdot \frac{x^2 - 1}{x^2 - x - 6} \Rightarrow \frac{\cancel{(x+2)}(x-2) \cancel{(x+1)}(x-1)}{\cancel{(x+1)}(x+1) (x-3) \cancel{(x+2)}} = \boxed{\frac{(x-2)(x-1)}{(x+1)(x-3)}}$$

$$8) \frac{x+4}{x^2-9} \div \frac{x^2+4x}{x+3} \div \frac{x-3}{x} \Rightarrow \frac{\cancel{(x+4)}(x+3) \cancel{(x)}}{\cancel{(x+3)}(x-3) \cancel{(x)} \cancel{(x+4)}(x-3)} = \boxed{\frac{1}{(x-3)^2}}$$

$$9) \frac{x^2+4x-32}{x^2-12x+35} \cdot \frac{x^2-10x}{x^2+11x+24} = \frac{\cancel{(x+8)} \cancel{(x-4)} (x) (x-10) \cancel{(x-7)} \cancel{(x+3)}}{\cancel{(x-7)}(x-5) \cancel{(-4)} \cancel{(x+4)} \cancel{(x+8)} \cancel{(x+3)}} = \boxed{\frac{x-10}{-4(x-5)}}$$

50 + and - Complex Rational Expressions

Perform the indicated operation.

$$10) \frac{\frac{3}{2x-1} + \frac{3}{x}}{2x-1} = \frac{1}{2x} + \frac{6}{2x} = \boxed{\frac{7}{2x}}$$

$$11) \frac{\frac{x+1}{x-2} - \frac{x}{x^2-4}}{2} = \frac{\left(\frac{x+1}{x-2}\right) \left(\frac{2}{x+2}\right) - \frac{x}{(x+2)(x-2)}}{2} = \frac{2x+2-x}{2(x+2)(x-2)} = \frac{x+2}{2(x+2)(x-2)} = \boxed{\frac{1}{x-2}}$$

$$12) \frac{\frac{2x-1}{x+5} + \frac{x}{x-2} - \frac{5x+4}{x^2+3x-10}}{\frac{(x-2)}{(x+5)(x-2)}} = \frac{\frac{2x^2-5x+2}{(x+5)(x-2)} + \frac{x^2+5x-5x+4}{(x+5)(x-2)}}{\frac{(x-2)}{(x+5)(x-2)}} = \frac{3x^2-5x-2}{(x+5)(x-2)}$$

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

51 Solving Rational Equations

Solve each equation for 'x'. (Indicate any constraints.)

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

$3x+6+5x-10 = 4x^2$

$4x^2 - 8x + 4 = 0$

$4(x^2 - 2x + 1) = 0$

$4(x-1)^2 = 0$

$x = 1$

14) $\frac{4}{x^2-8x+12} = \frac{x}{x-2} + \frac{1}{x-6}$

$4 = x^2 - 6x + x - 2$

$x^2 - 5x - 6 = 0$

$(x+1)(x-6) = 0$

$x = -1, 6$

15) $\frac{x-2}{x+1} = \frac{x-3}{x^2-5x-6} - \frac{2x-7}{x-6}$

$x^2 - 8x + 12 = x - 3 - (2x^2 - 5x - 7)$

$x^2 - 8x + 12 = x - 3 - 2x^2 + 5x + 7$

$3x^2 - 14x + 8 = 0$

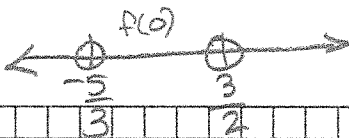
$(3x - 2)(x - 4) = 0$

$x = \frac{2}{3}, 4$

52 Solving Rational Inequalities

Solve each rational inequality algebraically or by graphing.

16) $\frac{3x+5}{2x-3} > 0$



$\frac{5}{3} > 0$ NO

$x > \frac{3}{2}$
or
 $x < -\frac{5}{3}$

17) $\frac{x}{x+1} + \frac{2x}{x-1} > \frac{2}{x^2-1}$

$\frac{(x-1)x}{x+1} + \frac{2x(x+1)}{x-1} - \frac{2}{x^2-1} > 0$

$\frac{x^2 - x + 2x^2 + 2x - 2}{(x+1)(x-1)} > 0$

$\frac{3x^2 + x - 2}{(x+1)(x-1)} > 0$

$\frac{(3x-2)(x+1)}{(x+1)(x-1)} > 0$



$-1 < x < \frac{2}{3}$ or $x > 1$

18) $x-1 \leq \frac{2}{x}$

$x-1 - \frac{2}{x} \leq 0$
 $\frac{x^2 - x - 2}{x} \leq 0$

$\frac{(x+1)(x-2)}{x} \leq 0$



$f(1) = \frac{2(-1)}{1} = \text{yes}$

$x < -1$
 $0 < x < 2$