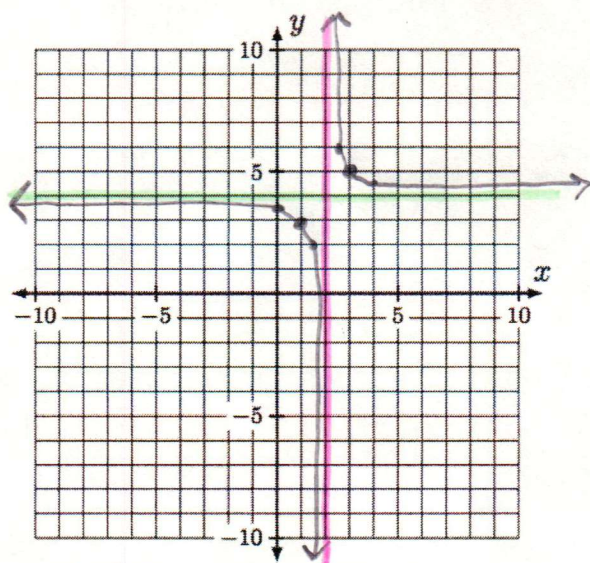


Unit 4 Review

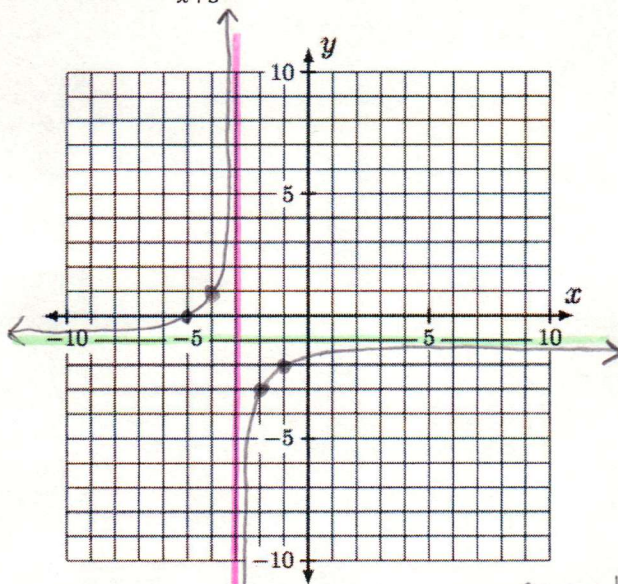
Graph each rational function, mark all asymptotes and anchor points.

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



shift right 2  
shift up 4

2.  $g(x) = \frac{-2}{x+3} - 1$



shift left 3 reflect  
shift down 1 stretch x2

For each rational function determine **as many features** as you can without graphing. Be as specific as you can.

3.  $y = \frac{x+2}{x^2-x-6} \quad \frac{x+2}{(x-3)(x+2)}$

Domain:  $x \neq 3, -2$   
 Range:  $y \neq 0, -\frac{1}{5}$   
 HA:  $y = 0$   
 VA:  $x = 3$   
 hole at  $(-2, -\frac{1}{5})$   
 X-int: none  
 y-int:  $(0, -\frac{1}{3})$   
 decreasing:  
 $(-\infty, -2) \cup (-2, 3) \cup (3, \infty)$

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

Domain:  $x \neq -3$   
 Range:  $y \neq 1$   
 HA:  $y = 1$   
 VA:  $x = -3$   
 X-int:  $(4, 0)$   
 y-int:  $(0, -\frac{4}{3})$   
 decreasing:  
 $(-\infty, -3) \cup (-3, \infty)$



Perform the indicated operation, make sure all answers are fully simplified. Show all steps.

5.  $\frac{n^2+6n+5}{n+1} \cdot \frac{n^2+11n+28}{n^2+9n+20}$

$$\frac{\cancel{(n+5)}\cancel{(n+1)}}{\cancel{(n+1)}} \cdot \frac{\cancel{(n+4)}(n+7)}{(n+4)\cancel{(n+5)}}$$

$$\boxed{\frac{n+7}{1}}$$

6.  $\frac{96}{38x} \cdot \frac{25x^2}{45x}$

$$\frac{\cancel{96}}{\cancel{38}x} \cdot \frac{5}{9}$$

$$\frac{\cancel{48}}{19} \cdot \frac{5}{\cancel{9}}$$

$$\frac{16}{19} \cdot \frac{5}{3}$$

$$\boxed{\frac{80}{57}}$$

7.  $\frac{4x}{x-6} \div \frac{2x^2}{8x-48}$

$$\frac{2\cancel{4}x}{\cancel{(x-6)}} \cdot \frac{8\cancel{(x-6)}}{\cancel{2}x^2}$$

$$\boxed{\frac{16}{x}}$$

8.  $\frac{x^2+9x+20}{x^2+6x+5} \div \frac{x+5}{x^2-x-2}$

$$\frac{(x+4)\cancel{(x+5)}}{\cancel{(x+5)}\cancel{(x+1)}} \cdot \frac{\cancel{(x-2)}\cancel{(x+1)}}{(x+5)}$$

$$\boxed{\frac{(x+4)(x-2)}{(x+5)}}$$

9.  $\frac{(5x)^7}{(5x)^3x} + \frac{4(3)}{5x^2(3)}$  CD:  $15x^2$

$$\frac{35x}{15x^2} + \frac{12}{15x^2}$$

$$\boxed{\frac{35x+12}{15x^2}}$$

10.  $\frac{x-1}{x-2} - \frac{x^2+4x-4}{x^2+4x-12}$  CD:  $(x-2)(x+6)$

$$\frac{(x+6)(x-1)}{(x-2)(x+6)} - \frac{x^2+4x-4}{(x-2)(x+6)}$$

$$\frac{x^2+5x-6}{(x-2)(x+6)} - \frac{x^2+4x-4}{(x-2)(x+6)}$$

$$\frac{\cancel{x-2}}{\cancel{(x-2)}(x+6)}$$

$$\boxed{\frac{1}{x+6}}$$



$$11. \frac{x^2+4x+1}{x^2-4x-21} + \frac{x+2}{x-7} \quad \text{CD: } (x-7)(x+3)$$

$$\frac{x^2+4x+1}{(x-7)(x+3)} + \frac{(x+2)(x+3)}{(x-7)(x+3)}$$

$$\frac{x^2+4x+1}{(x-7)(x+3)} + \frac{x^2+5x+6}{(x-7)(x+3)}$$

$$\boxed{\frac{2x^2+9x+7}{(x-7)(x+3)}}$$

$$12. \frac{4x}{x^2+4x-5} - \frac{5}{x^2+3x-4} \quad \text{CD: } (x-1)(x+5)(x+4)$$

$$(x+5)(x-1) \quad (x+4)(x-1)$$

$$\frac{4x(x+4)}{\text{CD}} - \frac{5(x+5)}{\text{CD}}$$

$$\frac{4x^2+16x}{\text{CD}} - \frac{5x+25}{\text{CD}}$$

$$\boxed{\frac{4x^2+11x-25}{(x-1)(x+5)(x+4)}}$$

Solve each rational equation, check for extraneous solutions.

$$13. \frac{x+5}{x^2+x} = \frac{1}{x^2+x} - \frac{x-6}{x+1} \quad \text{CD: } x(x+1) \quad 14. \frac{1}{x} = \frac{6}{5x} + 1 \quad \text{CD: } 5x$$

$$x+5 = 1 - [x(x-6)]$$

$$x+5 = 1 - (x^2 - 6x)$$

$$x+5 = 1 - x^2 + 6x$$

$$x^2 - 5x + 4 = 0$$

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

$$\boxed{x = 1, 4}$$

$$5 = 6 + 5x$$

$$-1 = 5x$$

$$\boxed{x = -\frac{1}{5}}$$

$$15. \quad 1 + \frac{x^2 - 5x - 24}{3x} = \frac{x-6}{3x} \quad \text{CD: } 3x$$

$$3x + x^2 - 5x - 24 = x - 6$$

$$x^2 - 2x - 24 = x - 6$$

$$x^2 - 3x - 18 = 0$$

$$(x-6)(x+3) = 0$$

$$\boxed{x = 6, -3}$$

$$16. \quad \frac{3}{x^2 + 5x + 6} - \frac{x-6}{x^2 + 5x + 6} = \frac{1}{x+3} \quad \text{CD: } (x+3)(x+2)$$

$$3 - (x-6) = x+2$$

$$3 - x + 6 = x+2$$

$$-x + 9 = x+2$$

$$9 = 2x+2$$

$$7 = 2x$$

$$\boxed{x = \frac{7}{2}}$$

$$17. \quad \frac{3}{x-5} - \frac{20}{x^2-25} = \frac{2}{x+5} \quad \text{CD: } (x-5)(x+5) \quad 18. \quad \frac{x+5}{x^2-2x} - 1 = \frac{1}{x^2-2x} \quad \text{CD: } x(x-2)$$

$$3(x+5) - 20 = 2(x-5)$$

$$3x + 15 - 20 = 2x - 10$$

$$3x - 5 = 2x - 10$$

$$x - 5 = -10$$

$$x = -5$$

$$\boxed{\text{No Solution}}$$

$$x+5 - [x(x-2)] = 1$$

$$x+5 - (x^2 - 2x) = 1$$

$$x+5 - x^2 + 2x = 1$$

$$-x^2 + 3x + 5 = 1$$

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

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

$$\boxed{x = 4, -1}$$