

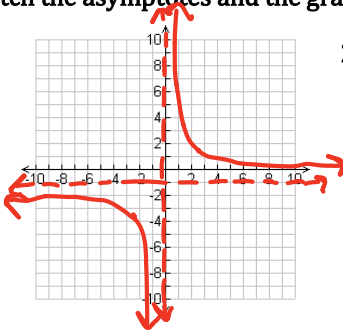
Math 3  
Unit 5 Test Review

Name: Key  
Date: \_\_\_\_\_

Directions: Sketch the asymptotes and the graph of each function. Identify the domain and the range.

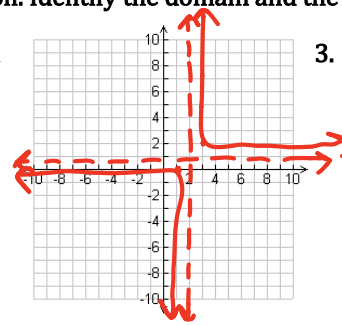
1.  $y = \frac{8}{x} - 1$

VA:  $x=0$   
HA:  $y=-1$



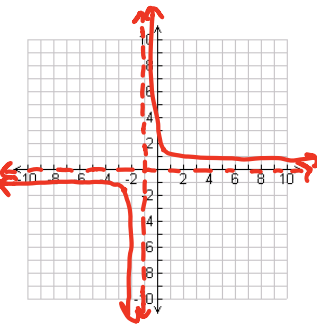
2.  $y = \frac{1}{x-2} + 1$

VA:  $x=2$   
HA:  $y=1$



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

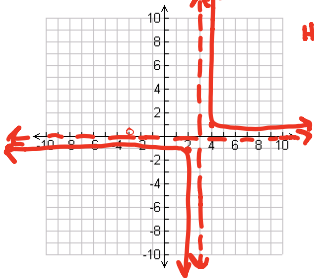
VA:  $x=-1$   
HA:  $y=0$



Directions: Find points of discontinuity, the domain, and x- and y-intercepts of each rational function.

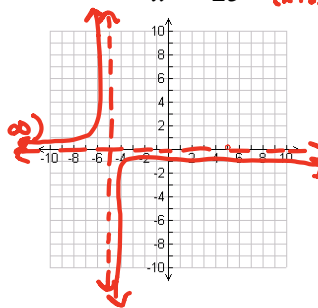
4.  $y = \frac{x+3}{x^2-9} = \frac{x+3}{(x+3)(x-3)} = \frac{1}{x-3}$

Hole:  $x=-3$   
 $(-3, \frac{1}{6})$   
VA:  $x=3$   
HA:  $y=0$   
D:  $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$   
R:  $(-\infty, 0) \cup (0, \infty)$   
x-int: none  
y-int:  $(0, -\frac{1}{3})$



5.  $y = \frac{-1(x-5)}{x^2-25} = \frac{-(x-5)}{(x+5)(x-5)} = \frac{-1}{x+5}$

Hole:  $x=5$   
 $(5, \frac{1}{10})$   
VA:  $x=-5$   
HA:  $y=0$   
D:  $(-\infty, -5) \cup (-5, 5) \cup (5, \infty)$   
R:  $(-\infty, 0) \cup (0, \infty)$   
x-int: none  
y-int:  $(0, -\frac{1}{5})$



Simplify. State any restrictions on the variables.

6.  $\frac{5x^2y}{10xy^4} = \frac{x}{2y^3} \quad y \neq 0$

7.  $\frac{4d^2+8d}{2d} = (2d+4)$

8.  $\frac{x^2+9x+18}{x+6} = \frac{(x+3)(x+6)}{(x+6)} = (x+3)$

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

10.  $\frac{3x+1}{x^2-x-6} \div \frac{6x^2+11x+3}{x^2+4x+4} = \frac{3x+1}{(x-3)(x+2)} \cdot \frac{(x+2)(x+2)}{(x+2)(x+3)} = \frac{(x+2)}{(x-3)(x+3)}$   
 $x \neq 3$   
 $x \neq -\frac{3}{2}$

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

12.  $\frac{2x^2+5x-3}{x^2-4x} \cdot \frac{2x^3-8x^2}{x^2+6x+9} = \frac{(2x-1)(x+3)}{x(x-4)} \cdot \frac{2x^2(x-4)}{(x+3)(x+3)} = \frac{2x(2x-1)}{(x+3)}$   
 $x \neq -3$

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

Simplify each sum or difference. State any restrictions on the variables.

$$14. \frac{(6x+1) \cdot 2x-5}{x+2} + \frac{2x-5}{2x+4}$$

$$\frac{12x+2+2x-5}{2(x+2)} = \frac{14x-3}{2(x+2)} \quad x \neq -2$$

$$15. \frac{8}{x^2-25} + \frac{9}{x-5}$$

$$\frac{8+9x+45}{(x+5)(x-5)} = \frac{9x+53}{(x+5)(x-5)} \quad \begin{matrix} x \neq -5 \\ x \neq 5 \end{matrix}$$

$$16. \frac{x-3}{x^2+3x} + \frac{7}{x+3}$$

$$\frac{x-3+7x}{x(x+3)} = \frac{8x-3}{x(x+3)} \quad \begin{matrix} x \neq 0 \\ x \neq -3 \end{matrix}$$

$$17. \frac{3x}{x^2+5x+6} - \frac{2x}{x^2+8x+16}$$

$$18. \frac{2}{x^2-1} - \frac{3}{1}$$

$$\frac{2-3x^2+3}{(x+1)(x-1)} = \frac{-3x^2+5}{(x+1)(x-1)} \quad \begin{matrix} x \neq -1 \\ x \neq 1 \end{matrix}$$

$$19. \frac{2x}{x-5} - \frac{x}{x+7}$$

$$\frac{2x^2+14x-x^2+5x}{(x-5)(x+7)} = \frac{x^2+19x}{(x-5)(x+7)} = \frac{x(x+19)}{(x-5)(x+7)} \quad \begin{matrix} x \neq 5 \\ x \neq -7 \end{matrix}$$

Solve each equation. Check each solution.

$$20. \frac{x}{4} = \frac{x+1}{3}$$

$$\begin{aligned} 4(x+1) &= 3x \\ 4x+4 &= 3x \\ -4x & \quad -4x \\ \hline 4 &= -x \\ -1 & \quad -1 \end{aligned} \quad \boxed{x=-4}$$

$$21. \frac{2}{x^2-1} = \frac{4}{x+1} \quad \text{Restrictions: } x \neq 1, x \neq -1$$

$$\begin{aligned} 4(x^2-1) &= 2(x+1) \\ 4x^2-4x &= 2x+2 \\ \frac{4x^2-6x-2}{2} &= \frac{0}{2} \end{aligned} \quad \begin{aligned} 2x^2-3x-1 &= 0 \\ \frac{-3 \pm \sqrt{9+8}}{4} &= \frac{-3 \pm \sqrt{17}}{4} \\ x &= \frac{-3+\sqrt{17}}{4}, x = \frac{-3-\sqrt{17}}{4} \end{aligned}$$

$$22. \left( \frac{3x}{5} + \frac{4}{x} = \frac{4x+1}{5} \right)^{5x} \quad \begin{matrix} \text{LCD: } 5x \\ \text{Restrictions: } x \neq 0 \end{matrix}$$

$$\begin{aligned} \frac{3x^2+20}{-3x^2-20} &= \frac{4x^2+x}{-3x^2-20} \\ \frac{3x^2+20}{-3x^2-20} &= \frac{4x^2+x}{-3x^2-20} \\ x^2+x-20 &= 0 \\ x &= -5, x = 4 \end{aligned}$$

$$23. \left( \frac{3x}{x-2} = 4 + \frac{x}{5} \right)^{5(x-2)} \quad \begin{matrix} \text{LCD: } 5(x-2) \\ \text{Restrictions: } x \neq 2 \end{matrix}$$

$$\begin{aligned} 15x &= 20(x-2) + x(x-2) \\ 15x &= 20x-40 + x^2-2x \\ 15x &= x^2+18x-40 \\ -15x & \quad -15x \\ \hline x^2+3x-40 &= 0 \end{aligned}$$

$$\frac{-3 \pm \sqrt{9+160}}{2} = \frac{-3 \pm \sqrt{169}}{2} = \frac{-3 \pm 13}{2} \quad \boxed{x=-8}, \boxed{x=5}$$

$$24. \left( x + \frac{x}{4} - \frac{x}{5} = 21 \right)^{20} \quad \begin{matrix} \text{LCD: } 20 \\ \text{Restrictions: } \text{None} \end{matrix}$$

$$\begin{aligned} 20x + 5x - 4x &= 420 \\ 21x &= 420 \\ \frac{21x}{21} &= \frac{420}{21} \\ \boxed{x=20} \end{aligned}$$

$$25. \left( \frac{3}{x+4} + \frac{5}{4} = \frac{18}{x+4} \right)^{4(x+4)} \quad \begin{matrix} \text{LCD: } 4(x+4) \\ \text{Restrictions: } x \neq -4 \end{matrix}$$

$$\begin{aligned} 12 + 5x + 20 &= 72 \\ 5x + 32 &= 72 \\ 5x &= 40 \\ \frac{5x}{5} &= \frac{40}{5} \\ \boxed{x=8} \end{aligned}$$