



## Practice

### 9.4 Rational Functions and Their Graphs

Determine whether each function below is a rational function. If so, find the domain. If the function is not rational, state why not.

$$1. f(x) = \frac{x^3 - 5x + 7}{x^2 - 3}$$

yes, all  $\mathbb{R}$  exc.  
 $x \neq -\sqrt{3}, \sqrt{3}$

$$2. h(x) = \frac{x+2}{|x|-2}$$

no,  $|x|-2$  is not a polynomial

$$3. w(x) = \frac{12-2x}{x^2-1}$$

yes, all  $\mathbb{R}$  # $\neq$  exc.  
 $x \neq 1, -1$

Identify all vertical and horizontal asymptotes of the graph of each rational function.

$$4. k(x) = \frac{2x+1}{x-9} \quad \text{VA: } x=9; \text{ HA: } y=2$$

$$5. p(x) = \frac{2x^2+3}{(x-1.5)^2} \quad \text{VA: } x=1.5; \text{ HA: } y=2$$

$$6. m(x) = \frac{3x-8}{x^2-7} \quad \text{VA: } x=\pm\sqrt{7}; \text{ HA: } y=0$$

Find the domain of each rational function. Identify all asymptotes and holes in the graph of each rational function.

$$7. h(x) = \frac{4x-3}{x^2-6x} \quad \text{D: all } \mathbb{R} \text{ exc. } x \neq 0, 6; \text{ VA: } x=0, x=6; \text{ HA: } y=0; \text{ Holes: None}$$

$$8. g(x) = \frac{x-1}{x^2+4x-5} \quad \text{D: all } \mathbb{R} \text{ exc. } x \neq 1, -5; \text{ VA: } x=-5; \text{ HA: } y=0; \text{ Hole @ } x=1$$

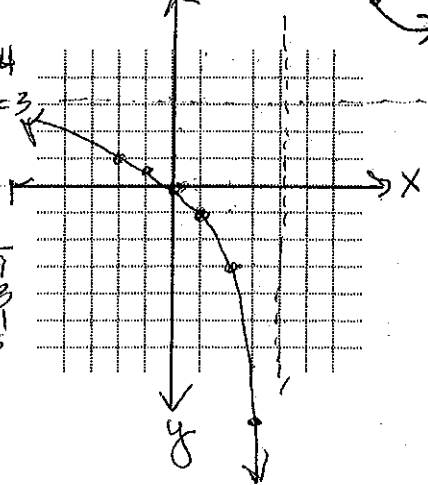
$$9. n(x) = \frac{3x^2+12x}{x^2+7x+12} \quad \text{D: all } \mathbb{R} \text{ exc. } x \neq -3, -4; \text{ VA: } x=-3; \text{ HA: } y=3; \text{ hole @ } x=-4$$

Sketch the graph of each rational function. Identify all asymptotes and holes in the graph of the function.

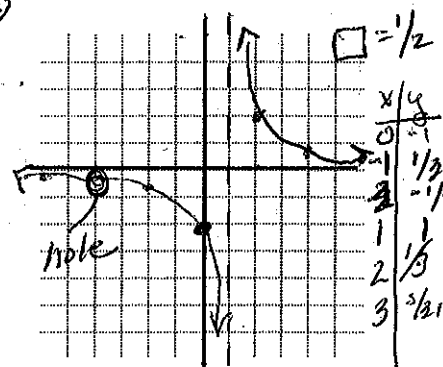
$$10. a(x) = \frac{3x}{x-4}$$

VA:  $x=4$   
HA:  $y=3$

x	y
3	-9
2	-3
1	-1
5	15
6	9
7	7
0	0
-1	3/5
-2	1



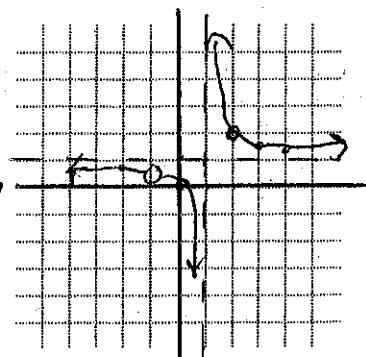
$$11. f(x) = \frac{x+2}{(x^2+3x+2)(x-2)}$$



VA:  $x=1/2$   
HA:  $y=0$   
Hole @  $x=-2$

$$12. b(x) = \frac{x+x^2}{x^2-1} \cdot \frac{x(x+1)}{(x+1)(x-1)}$$

VA:  $x=1$   
HA:  $y=1$   
Hole @  $x=-1$



x	y
0	0
-1	hole
-2	2/3
2	2
3	3/2
4	4/3