

**Rational Functions – 90% of Test**  
**Unit 1,2,3 10% of Test**

**Rational Functions and Their Graphs**

Complete the table

Rational Function	Points of Discontinuity	Holes	Vertical Asymptotes	Horizontal Asymptote	Y-intercept	X-Intercept
1. $y = \frac{3x+2}{x-1}$	$x=1$	N/A	$x=1$	$y=3$	$y=-2$	$x = -\frac{2}{3}$
2. $y = \frac{(x-5)}{(x-5)(x+4)}$	$x=5, -4$	$x=5$	$x=-4$	$y=0$	$y = \frac{1}{4}$	N/A

**Complex Fractions**

Simplify

$$\frac{b \cdot 1}{a \cdot 1} \cdot \frac{1 \cdot a}{1 \cdot b}$$

$$\frac{b \cdot a}{a \cdot b} = \frac{b \cdot a}{a \cdot b}$$

$$\frac{b-a}{a+b} \cdot \frac{a+b}{a+b} = \frac{b-a}{a+b}$$

$$\frac{b-a}{a+b}$$

**Simplifying Rational Expressions**

Simplify each rational expression. State any restrictions on the variable.

4.  $\frac{20x^2 + 60x}{50x} = \frac{20x^2(x+3)}{50x} = \frac{2(x+3)}{5}$

5.  $\frac{x^2 + 11x + 28}{x+7} = \frac{(x+7)(x+4)}{x+7} = x+4$

6.  $\frac{27x-90}{15x^3-50x^2} \div \frac{1}{5x^2} = \frac{9(3x-10)}{5x^2(3x-10)} \cdot \frac{5x^2}{1} = 9$

7.  $\frac{1}{x-2} \cdot \frac{(x-2)(x-8)}{x-5} = \frac{x-8}{x-5}$

8.  $\frac{x-6y}{15y^3} + \frac{4x}{15y^3} = \frac{5x-6y}{15y^3}$

9.  $\frac{x+5}{x+5} \cdot \frac{4}{3x} - \frac{x-6}{3x+15} \cdot x = \frac{4}{3x} - \frac{x(x-6)}{3(x+5)x}$

$\frac{4x+20}{3x(x+5)} + \frac{-x^2+6x}{3x(x+5)} = \frac{-x^2+10x+20}{3x(x+5)}$

### Solving Rational Equations

Solve each equation.

10.  $\frac{6}{x-1} \times \frac{2}{x+5}$   $2x-2 = 6x+30$   
 $-4x = 32$   
 $x = -8$

11.  $\frac{2}{x^2-1} \times \frac{4}{x+1}$   $2x+2 = 4x^2-4$   
 $0 = 4x^2 - 2x - 6$   
 $0 = 2(2x^2 - x - 3)$   
 $0 = 2(x+1)(x-3)$

$\frac{-6}{-3} \times \frac{-2}{-1}$

12.  $\frac{4 \cdot 3}{4 \cdot x+4} + \frac{5 \cdot 18}{4 \cdot x+4} = \frac{18 \cdot 4}{x+4}$

$\frac{12}{4(x+4)} + \frac{5x+20}{4(x+4)} = \frac{72}{4(x+4)}$   
 $5x+32 = 72$   
 $5x = 40$   
 $x = 8$

13.  $\frac{(x-6) \cdot 6}{(x-6) \cdot x-5} - \frac{1}{x^2-11x+30} = \frac{3}{x-5(x-6)}$

$\frac{6x-36-1}{(x-6)(x-5)(x-6)(x-5)} = \frac{3x-18}{(x-6)(x-5)}$   
 $6x-37 = 3x-18$   
 $3x = 19$   
 $x = \frac{19}{3}$

14.  $y = \frac{x+3}{x^2-x-12}$

15.  $y = \frac{3x-3}{x^2-x}$

Points of Discontinuity:  $x = -3, 4$

Points of Discontinuity:  $x = 0, 1$

Holes:  $x = -3$

Holes:  $x = 1$

Vertical Asymptotes:  $x = 4$

Vertical Asymptotes:  $x = 0$

Horizontal Asymptotes:  $y = 0$

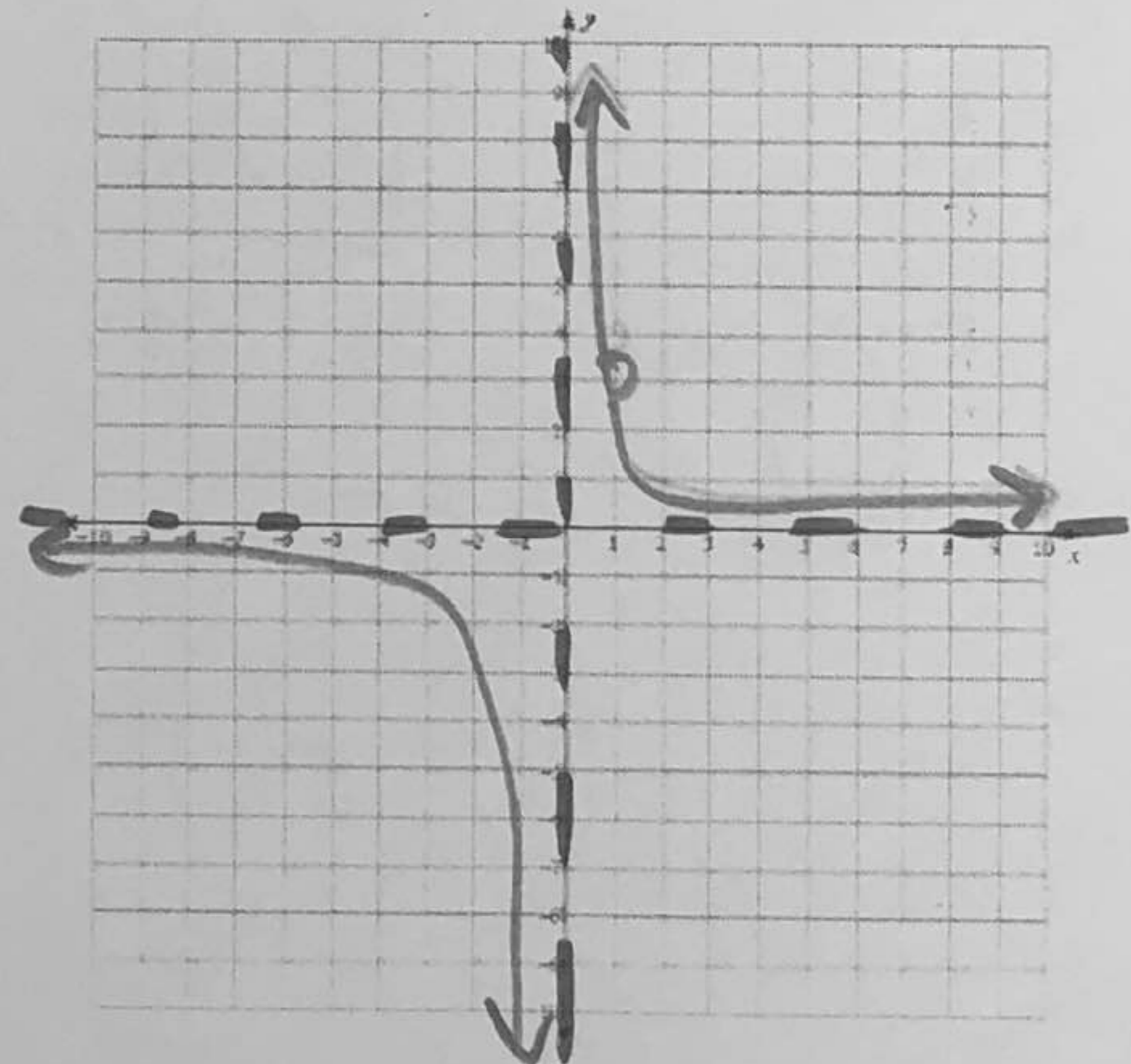
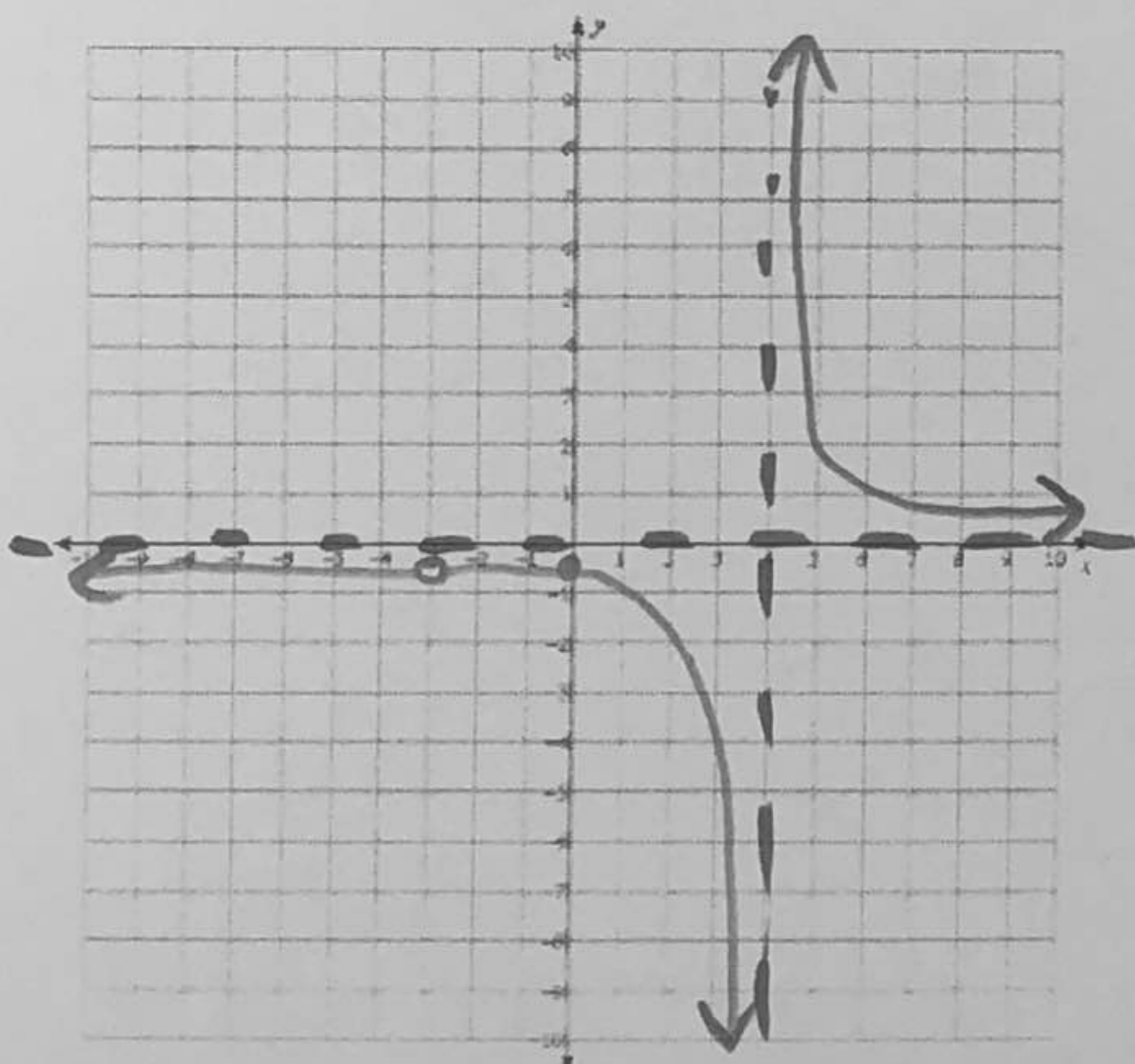
Horizontal Asymptotes:  $y = 0$

x-intercept: None

x-intercept: N/A

y-intercept:  $y = \frac{1}{4}$

y-intercept: N/A



Match each graph with the correct function.

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

a.  $g(x) = \frac{1}{x-1}$  C

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

b.  $g(x) = \frac{-1}{x-1}$  B

VA  $x=1$  HA  $y=1$

c.  $g(x) = \frac{x+1}{x-1}$  E

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

e.  $g(x) = \frac{x}{x+2}$  F

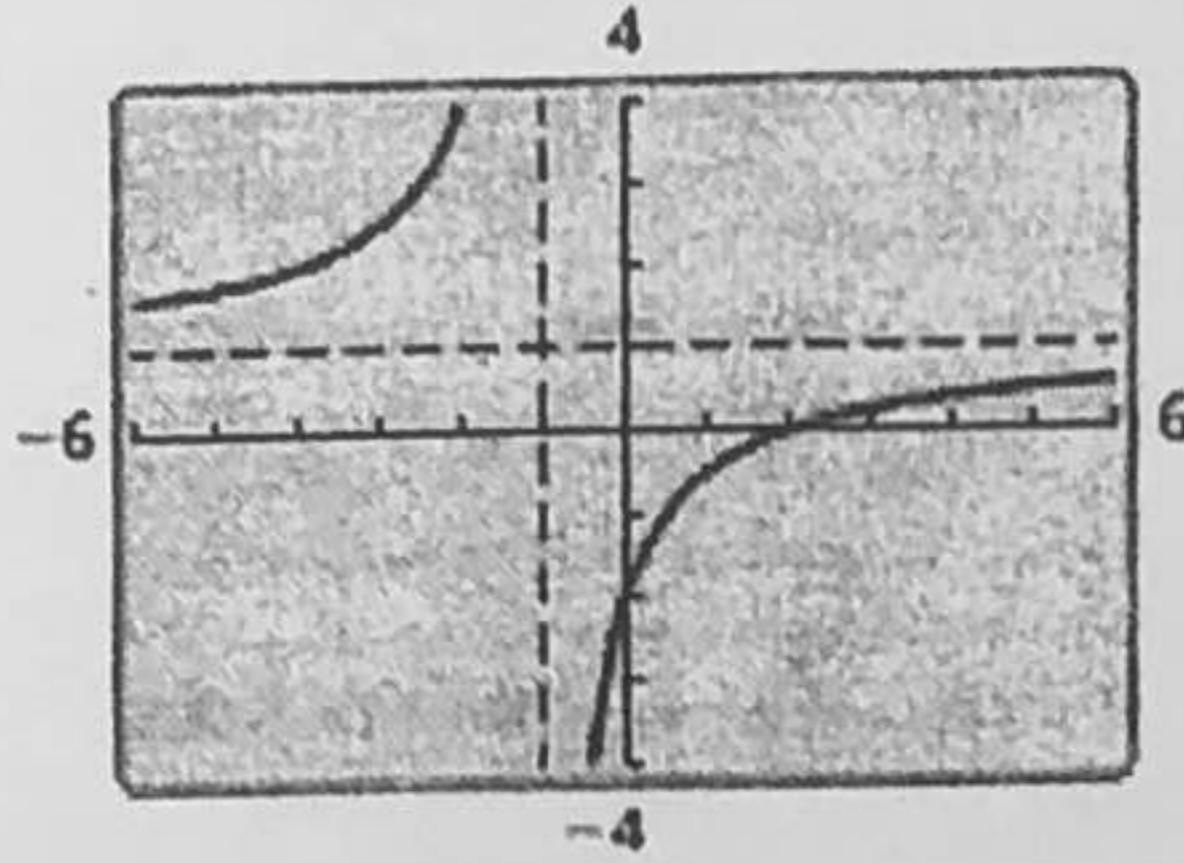
f.  $g(x) = \frac{-x}{x+2}$  D

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

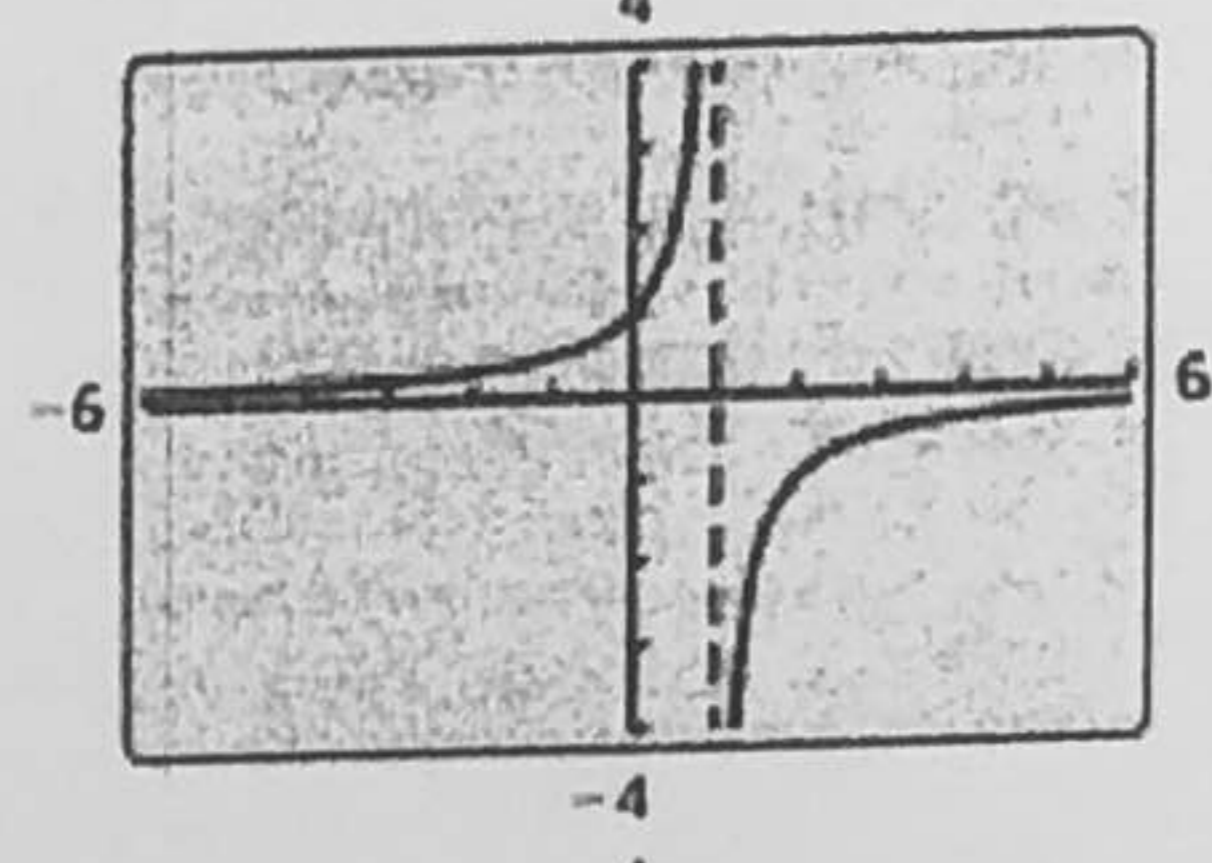
VA:  $x=-2$  HA:  $y=1$

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

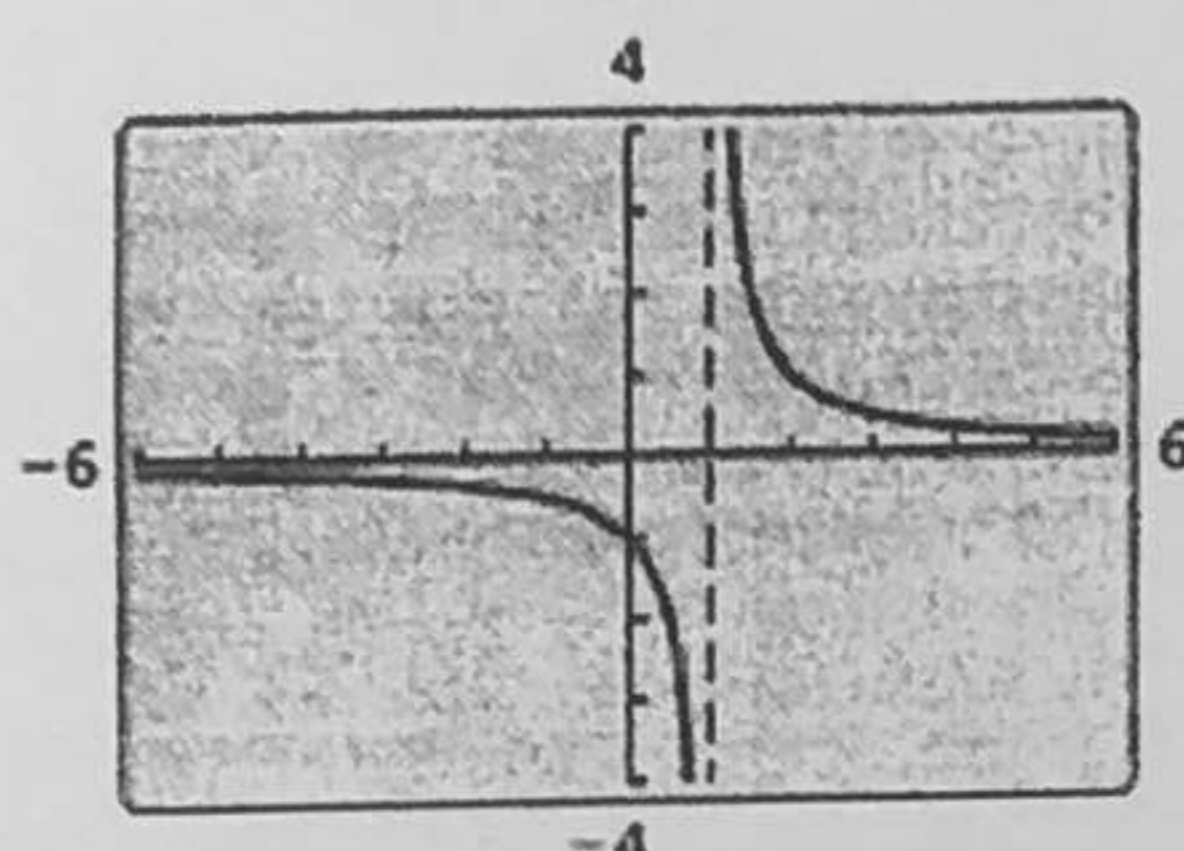
~~A.~~



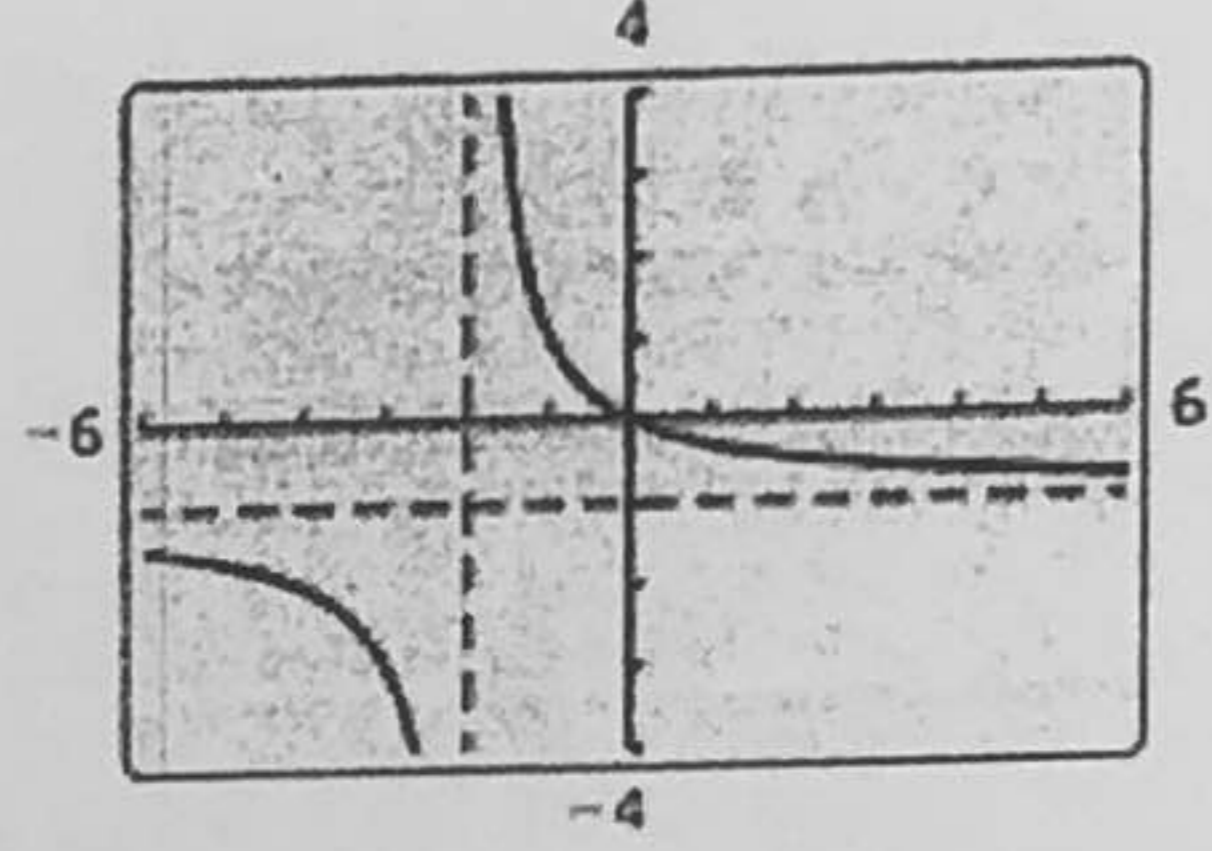
~~B.~~



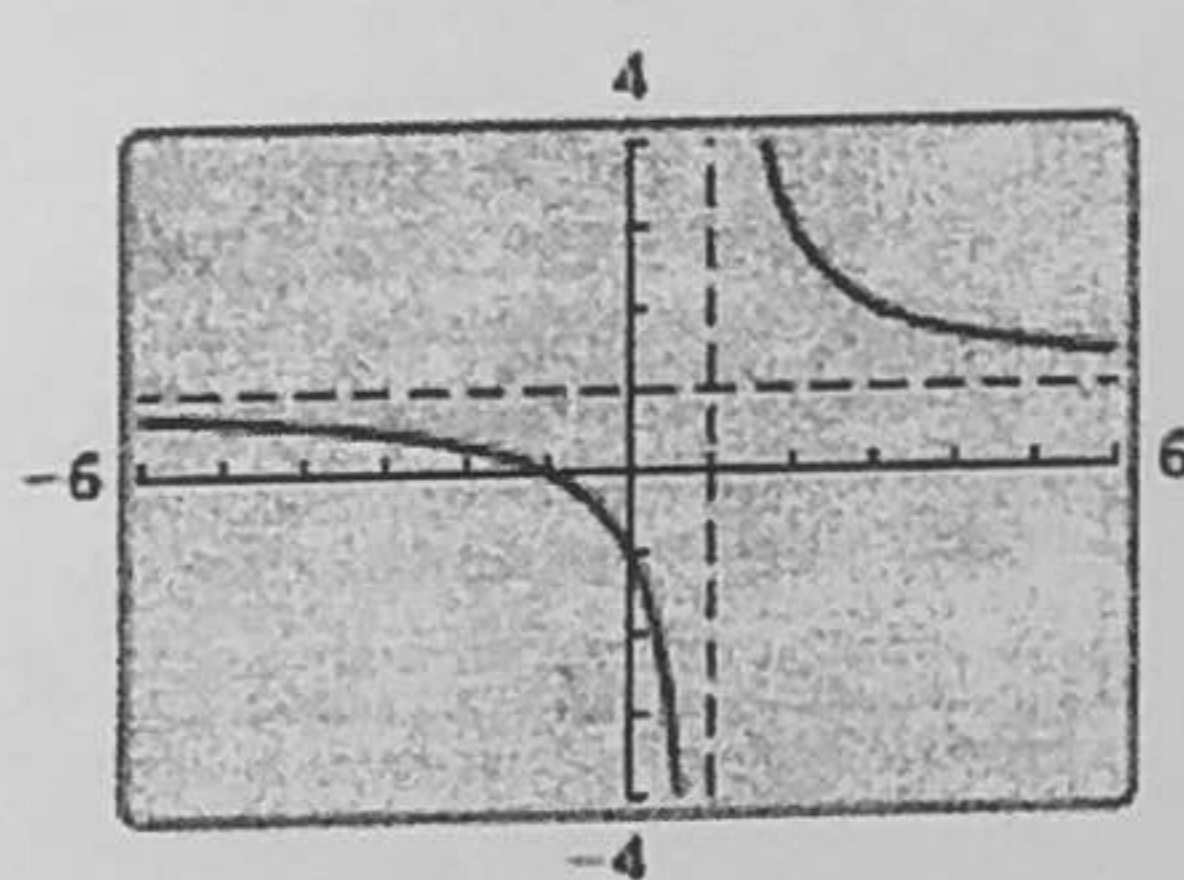
~~C.~~



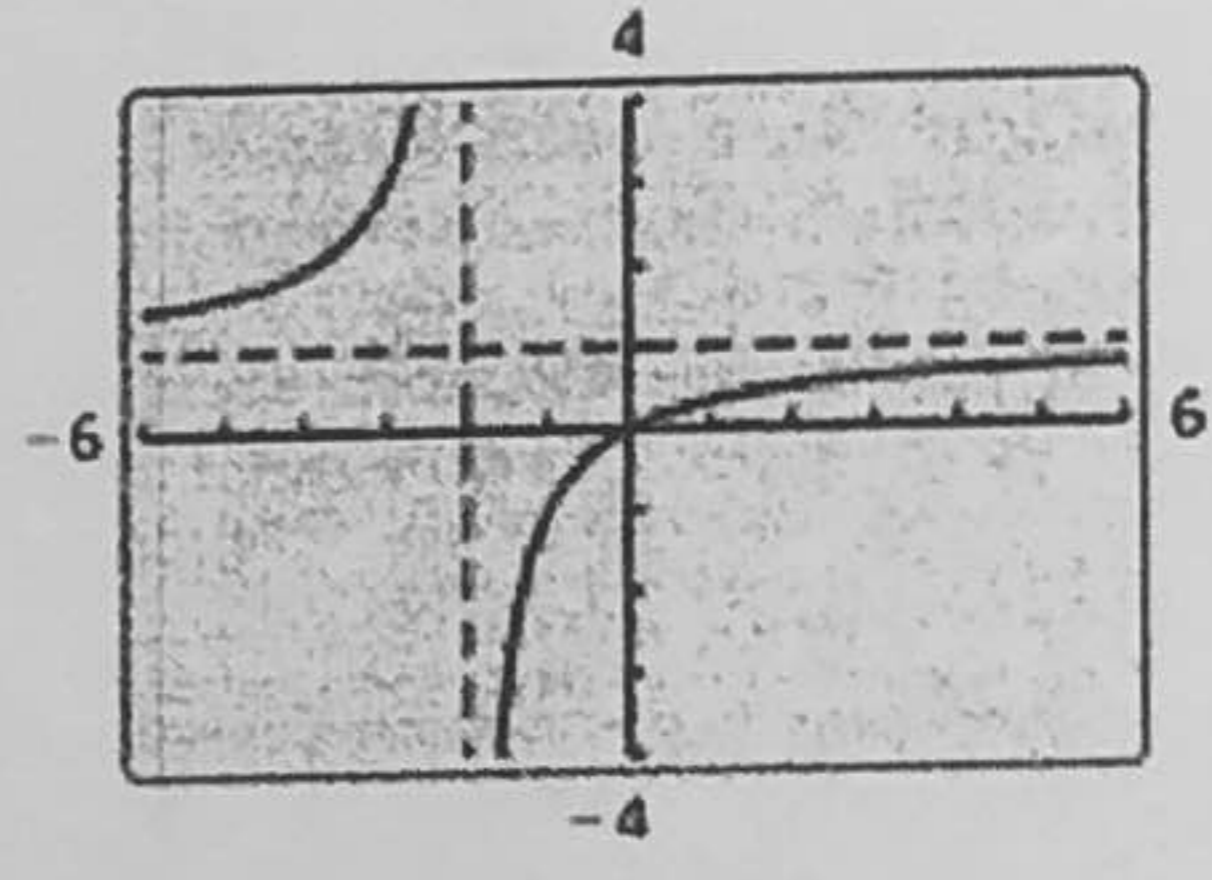
~~D.~~



~~E.~~



~~F.~~



d 1.  $y = \frac{2x^2 - 3x - 2}{x^2 - 2x - 8} = \frac{(x-2)(2x+1)}{(x-4)(x+2)}$

\_\_\_\_\_ 2.  $y = \frac{x^2 - 2x - 8}{2x^2 - 3x - 2} = \frac{(x-4)(x+2)}{(x-2)(2x+1)}$

a 3.  $y = \frac{2x-2}{x^2-x-6} = \frac{2(x-1)}{(x-3)(x+2)}$

C 4.  $y = \frac{2x^2 - 18}{x+3} = \frac{2(x+3)(x-3)}{x+3}$

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

