

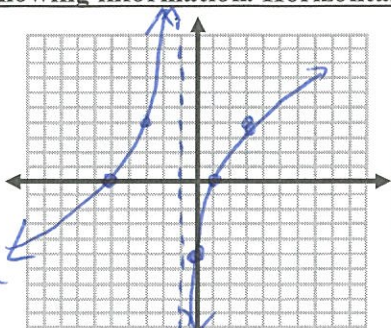
\* Look for Holes first  
\* Plug in points to graph

Graph the function and label the following information. Horizontal Asymptotes can include slant asymptotes.

1.  $y = \frac{x^2 + 4x - 5}{x + 1}$

$y = \frac{(x+5)(x-1)}{(x+1)}$

deg of numerator > deg denom  
SLANT  $y = x$

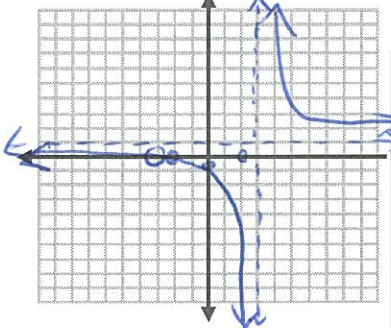


Zeros: $x$ -int	$(-5, 0)$ and $(1, 0)$
Vertical Asymptotes:	$x = -1$
Horizontal Asymptotes:	SLANT
Holes:	None
Y-Intercept(s):	$(0, -5)$
Domain:	$(-\infty, -1) \cup (-1, \infty)$
range	$(-\infty, \infty)$

2.  $y = \frac{x^2 + 5x + 6}{x^2 - 9}$

$y = \frac{(x+3)(x+2)}{(x+3)(x-3)}$

deg denom = deg num.

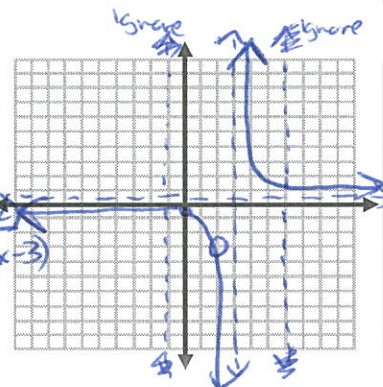


Zeros: $x$ -int	$(-2, 0)$
Vertical Asymptotes:	$x = 3$
Horizontal Asymptotes:	$y = 1$
Holes:	$x = -3$
Y-Intercept(s):	$(0, -2/3)$
Domain:	$(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$
range	$(-\infty, -5/6) \cup (-5/6, 1) \cup (1, \infty)$

3.  $y = \frac{x^2 - 4}{3x^2 - 15x + 18}$

$y = \frac{(x-2)(x+2)}{3(x-2)(x-3)}$

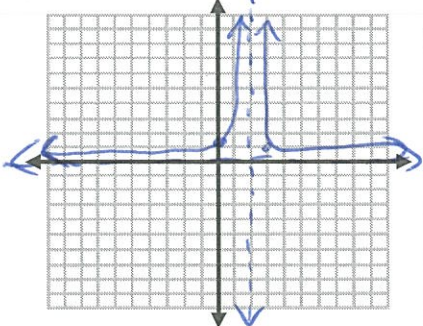
deg denom = degree num



Zeros: $x$ -int	$(2, 0)$ and $(-2, 0)$
Vertical Asymptotes:	$x = 3$
Horizontal Asymptotes:	$y = \frac{1}{3}$
Holes:	$x = 2$
Y-Intercept(s):	$(0, -2/9)$
Domain:	$(-\infty, 2) \cup (2, \infty)$
range	$(-\infty, -4/3) \cup (4/3, 4/3) \cup (4/3, \infty)$

4.  $y = \frac{5}{(x-2)^2}$

deg denom > deg num



Zeros: $x$ -int	None
Vertical Asymptotes:	$x = 2$
Horizontal Asymptotes:	$y = 0$
Holes:	None
Y-Intercept(s):	$(0, 5/4)$
Domain:	$(-\infty, 2) \cup (2, \infty)$
range	$(0, \infty)$

Write a rational function with the given characteristics.

5 There are no zeros, a hole exists at  $x = -3/2$ , vertical asymptote is at  $x = 1$ , and horizontal asymptote is at  $y = 0$ .

X-intercepts  
No  $x$  in num fact is n't a hole.

Need  $(2x+3)$   
 $(2x+3)$

Need  $(x-1)$  in denom

Need bottom deg > top degree

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

6. There is a <sup>x-int</sup> zero at 6, a hole exists at  $x = -3$ , no vertical asymptotes, and horizontal asymptote at  ~~$y = x - 6$~~   $y = x - 6$ .  
 Need  $(x-6)$  in numerator      Need  $(x+3)$  in denominator      No extra in denom.

$$f(x) = \frac{(x-6)(x+3)}{(x+3)}$$

7. The <sup>x-int</sup> zeros are at  $-1$  and  $3$  and the vertical asymptote is at  $x = 0$ .  
 Need  $(x+1)(x-3)$  in numerator      Need  $x$  in denominator

$$f(x) = \frac{(x+1)(x-3)}{x}$$

8. The <sup>x-int</sup> zero is at  $2$ , vertical asymptote is at  $x = -2$  and  $x = 0$ , and horizontal asymptote is at  $y = 0$ .  
 Need  $(x-2)$  in numerator      Need  $(x+2)$  and  $x$  in denominator      bottom deg > top deg

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

Match the following graphs with the equation

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

10.  $f(x) = \frac{x^2 - x - 12}{x^2 - 2x - 8} = \frac{(x-4)(x+3)}{(x-4)(x+2)}$

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

HA: Slant:  $y = 3x$

$y = 1$

SLANT:  $y = x$

VA:  $x = -1$

$x = -2$

$x = 1$

<sup>x-int</sup> roots:  $(0, 0), (-3, 0)$

$(-3, 0)$

None

holes:  $x = 3$

$x = 4$

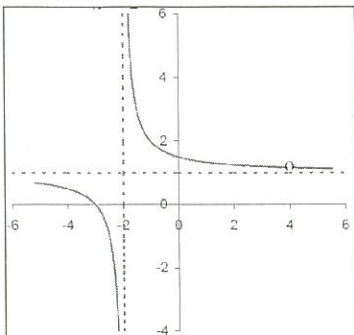
$x = -1$

graph: A B (C)

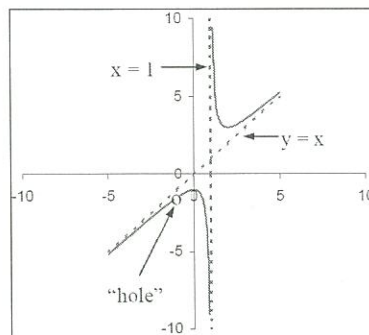
graph: (A) B C

graph: A (B) C

A.



B.



C.

