

— set denom. = 0

Find the vertical and horizontal asymptotes, or identify if an asymptote does not exist, for the following rational functions.

TIP DEGREE < BOTTOM DEGREE

1. $f(x) = \frac{2+0x}{x}$

VA: $x=0$

HA: $y=0$

SAME DEGREE

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

VA: $x=0$

HA: $y = \frac{1}{3}$

TIP DEGREE > BOTTOM DEGREE

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

VA: $x=1$

HA: ~~none~~ none

4. $f(x) = \frac{0x^2 + x + 1}{x^2}$

VA: $x=0$

HA: $y=0$

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

VA: none

HA: $y=2$

6. $f(x) = \frac{x^2+1}{2x}$

VA: $x=0$

HA: none

7. Explain how you find the vertical asymptote of a rational function.

Set denom. = 0

8. Explain how you find the horizontal asymptote of a rational function.

look at degree of num. vs. degree of denom.

Generalizing the concept of horizontal asymptotes: Three Cases according to where the highest power of x is located...

1. ... in the numerator: (#3,6)

then no horiz. asymptote

2. ... in the denominator: (#1,4)

then HA $y=0$

3. ... the same in numerator and denominator: (#2,5)

$y = \frac{\text{leading coeff.}}{\text{leading coeff.}}$

then use the coefficients of those term and make a ratio = y

OW - Fri.

Honors Math III – Graphing Rational Functions

In #1-4, find the domain of the function.

1. $f(x) = \frac{3}{x-5}$

$\{x | x \neq 5\}$

2. $f(x) = \frac{x+4}{x+6}$

$\{x | x \neq -6\}$

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

$\{x | x \neq 3\}$

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

$\{x | x \neq -1, -2\}$

In #5-8, find the vertical asymptote (Where is the function undefined?)

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

$x = \frac{1}{2}$

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

$x = -1, x = 3$

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

$x = \pm 2$

8. $f(x) = \frac{x}{x^2-4x-12} = \frac{x}{(x-6)(x+2)}$

$x = 6, -2$

In #9-12, find the horizontal asymptote (What happens to y as x gets bigger?)

9. $f(x) = \frac{1}{x+6}$

$y = 0$

10. $f(x) = \frac{2x}{x-3}$

$y = 2$

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

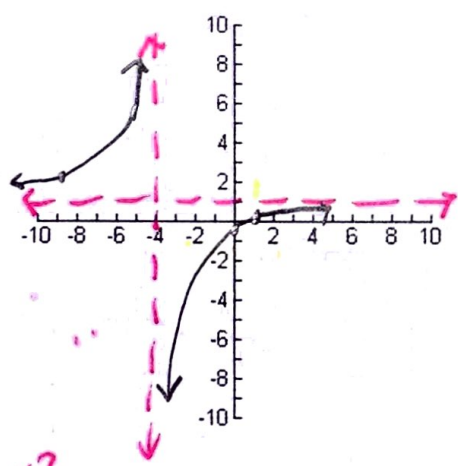
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12. $f(x) = \frac{x^2+5}{2x^2-x-1}$

$y = \frac{1}{2}$

Graph the following rational functions and answer the questions.

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



Domain: $\{x | x \neq -4\}$

Zeros: $(1, 0)$

Y-intercept: $(0, -\frac{1}{4})$

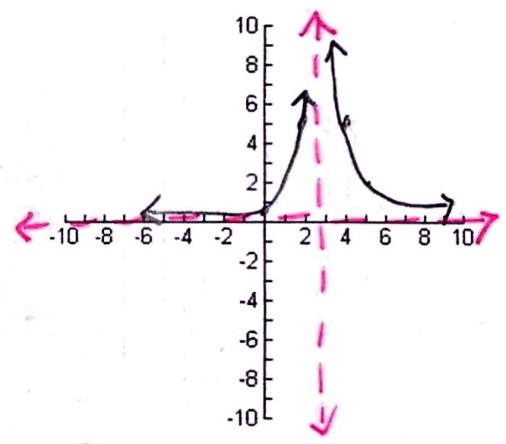
Vertical Asymptote(s): $x = -4$

Horizontal Asymptote: $y = 1$

Is there a hole in the graph? no

If so, where? —

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



Domain: $\{x | x \neq 3\}$

Zeros: none

Y-intercept: $(0, \frac{5}{9})$

Vertical Asymptote(s): $x = 3$

Horizontal Asymptote: $y = 0$

Is there a hole in the graph? no

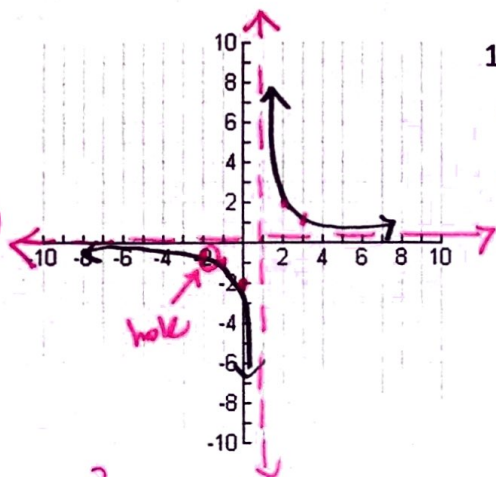
If so, where? —

15.

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

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

$$= \frac{2}{x-1}$$



Domain: $\{x | x \neq 1, -2\}$

Zeros: none

Y-intercept: $(0, -2)$

Vertical Asymptote(s): $x=1$

Horizontal Asymptote: $y=0$

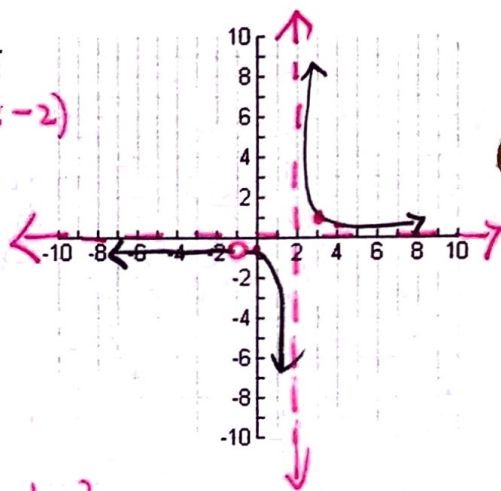
Is there a hole in the graph? yes

If so, where? $(-2, -\frac{2}{3})$

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

$$(x+1)(x-2)$$

$$= \frac{1}{x-2}$$



Domain: $\{x | x \neq -1, 2\}$

Zeros: none

Y-intercept: $(0, -\frac{1}{2})$

Vertical Asymptote(s): $x=2$

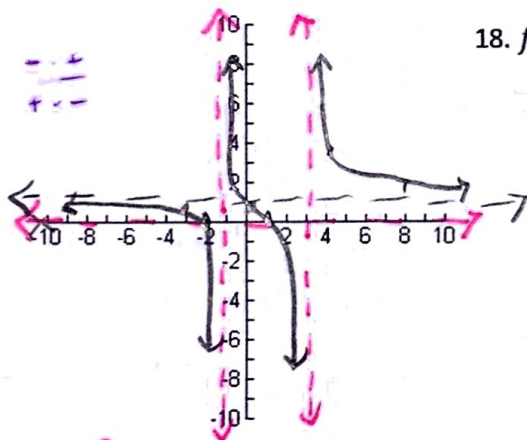
Horizontal Asymptote: $y=0$

Is there a hole in the graph? yes

If so, where? $(-1, -\frac{1}{3})$

17.

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



Domain: $\{x | x \neq -1, 3\}$

Zeros: $(1, 0)$ $(-2, 0)$

Y-intercept: $(0, \frac{2}{3})$

Vertical Asymptote(s): $x=-1, x=3$

Horizontal Asymptote: $y=\frac{1}{3}$

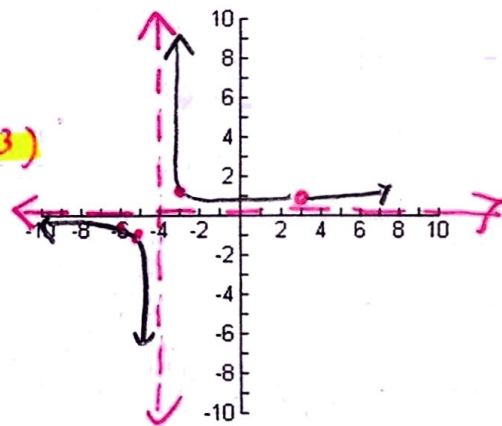
Is there a hole in the graph? no

If so, where? —

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

$$= \frac{x-3}{(x+4)(x-3)}$$

$$= \frac{1}{x+4}$$



Domain: $\{x | x \neq -4, 3\}$

Zeros: none

Y-intercept: $(0, \frac{1}{4})$

Vertical Asymptote(s): $x=-4$

Horizontal Asymptote: $y=0$

Is there a hole in the graph? yes

If so, where? $(3, \frac{1}{7})$