

Writing Rational Equations given characteristics Notes

Name: KEY

Write a rational function with the given characteristics. Note: There are various final answers.

- 1.) zero at 0, vertical asymptotes at $x = -3$ and $x = 3$, and holes at $x = -1$ and $x = 1$.

x -int $\Rightarrow 0$
 VA $\Rightarrow x = -3, 3$
 holes $\Rightarrow x = -1, 1$

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

- 2.) vertical asymptote at $x = 1$, and hole at $x = 0$.

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

- 3.) holes at $x = 3$ and $x = -7$ and horizontal asymptote at $y = 2$.

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

need some other factors so it's a Rational function when graphed

- 4.) no zeros, no vertical asymptotes, and a horizontal asymptote at $y = 1$.

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

can't have any x 's to solve for on top or bottom that are real #'s

- 5.) vertical asymptote at $x = 0$, hole at $x = -2$, and horizontal asymptote at $y = 5$.

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

need some other factor so the numerator matches the denominator of x^2

- 6.) vertical asymptotes of $x = 1$, $x = \frac{-1}{3}$ and horizontal asymptote of $y = 5$.

$$f(x) = \frac{15x^2}{(x-1)(3x+1)}$$

has to reduce to be 5

- 7.) vertical asymptote of $x = 4$, a horizontal asymptote of $y = 3$ and a zero at $x = -2$.

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

8. Write a rational equation with vertical asymptotes of $x = 1$, $x = -2$.

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

challenge!

9. Write a rational equation with no vertical asymptotes and a horizontal asymptote of $y = 0$.

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

$$\begin{aligned} x^2+4 &= 0 \\ \sqrt{x^2} &= \sqrt{-4} \end{aligned}$$

$x = \pm 2i$
 so not a real

10. Write a rational equation with vertical asymptotes of $x=0$, $x=\frac{5}{2}$ and horizontal asymptote of $y=2$.

$f(x) = \frac{4x^2}{x(2x-5)}$ $\Rightarrow \frac{4x^2}{2x^2-5x}$ has to reduce to 2

11. Write a rational equation with vertical asymptote of $x=-1$, a horizontal asymptote of $y=2$ and a zero at $x=3$.

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

12. Write a rational equation with vertical asymptotes of $x=0$ and $x=\frac{4}{3}$ and horizontal asymptote of $y=-2$.

$f(x) = \frac{-6x^2}{x(3x-4)}$ $\Rightarrow \frac{-6x^2}{3x^2-4x}$ has to reduce to -2

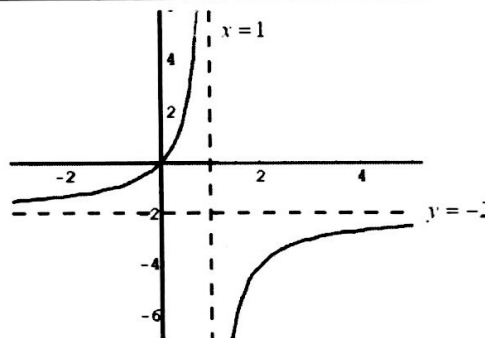
13. No vertical asymptotes and a y-intercept of (0,5)

$f(x) = \frac{x(x+5)}{x}$

14. Write an equation for graph.

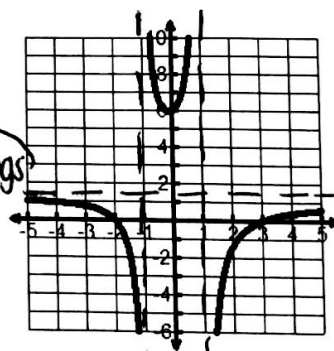
VA: $x=1$
 HA: $y=-2$
 x-int: 0
 y-int: 0
 no holes

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



15. Write an equation for the graph.

VA: $x=-1, 1$
 HA: $y=1$ (maybe a little higher 1.5)? ← complicates things
 x-int: $x=-2, 3$
 y-int: $y=0$
 no holes



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