

Core Quiz 1314, Example $f(x) = \frac{4x^2(x-3)(x+4)}{2(x-2)^2(x+2)^2}$

- a) Determine the equation of the vertical asymptotes of $f(x)$ and their multiplicity.

$$2(x-2)^2(x+2)^2 = 0$$

So $x = 2$ with multiplicity 2 and $x = -2$ with multiplicity 2 are the vertical asymptotes.

- b) State the domain: from part (a) we see that $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$
c) Calculate the y-intercept. State it as a coordinate pair.

$$f(0) = \frac{4(0)^2(0-3)(0+4)}{2(0-2)^2(0+2)^2} = \frac{0}{32} = 0$$

Y intercept is (0,0).

- d) Determine the **equation** of the horizontal asymptotes, or state that there are not any. Show work that explains how you found it/them.

The degree of the numerator = degree of the denominator (=4) so the HA is the ratio of the leading coefficients. So the HA is $y = 4/2$ or $y = 2$.

(Note: your problem may not have the degrees equal. You have to know how to find the HA for each case.)

- e) Calculate the x-intercepts. State it/them as coordinate pairs.

Set the numerator = 0. $4x^2(x-3)(x+4) = 0$ so $x = 0, 3, -4$

- f) Use (d) and (e) to fill out the following chart.

X-intercepts/Zeros	Multiplicity	Meaning
0	2	Even means same side. Touches axis.
3	1	Odd means opposite sides. Crosses axis.
-4	1	Odd means opposite sides. Crosses axis.

Vertical Asymptotes	Multiplicity	Meaning
2	2	Even multiplicities mean that the graph goes in the same direction on either side of the asymptote.
-2	2	

- g) Use all of the collected information to sketch a graph. Find additional (x,y) points on the graph as you may need. (Note: my software would not let me do dashed lines for the asymptotes, but you need to be sure they are dashed. That indicates that they are not actually part of the graph.)

