

Precalculus Unit 3: 3.1-3.3 Review

Rational Functions, Scatter Plots, and Regression Equations

Complete the following problem.

1. For the function $f(x) = \frac{x^2+x-12}{x^2-x-6} = \frac{(x+3)(x+4)}{(x-3)(x+2)}$

Domain: $\mathbb{R}, x \neq 3, x \neq -2$

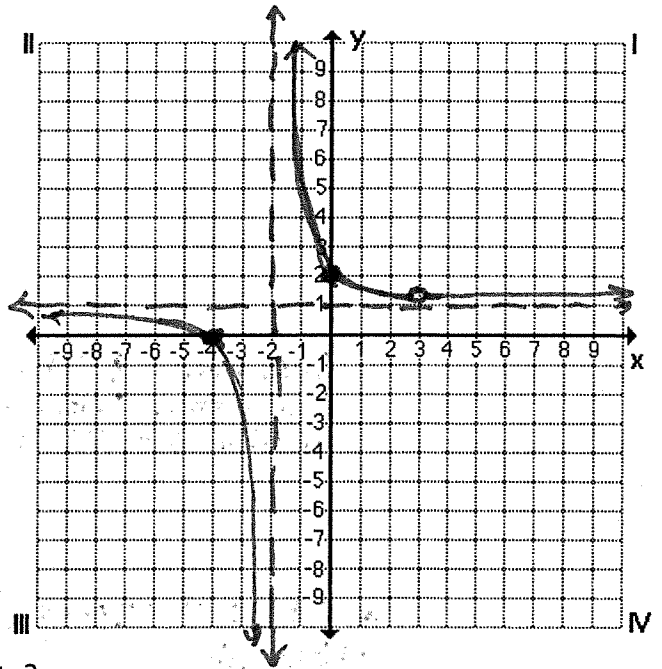
Vertical Asymptote(s):

$x = -2$

Hole: $(3, \frac{7}{5})$ $\frac{x+4}{x-2} \Rightarrow \frac{7}{5}$

Horizontal/Slant Asymptote:

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



How did you find the horizontal/slant asymptote?

The degree is the same so the leading coefficients are used to determine the horizontal asymptote

x-intercept(s):

$\frac{x+4}{x+2} = 0$ $x+4=0$ $x=-4$

y-intercept:

$\frac{0^2+0-12}{0^2-0-6} = \frac{-12}{-6} = 2$ $y=2$

Sketch the function on the provided graph. Make sure to accurately plot all of the features of the graph found above.

2. Find the slant asymptote for the function $f(x) = \frac{2x^3+3x^2-8x+2}{x^2+4x-1}$.

$$\begin{array}{r} 2x-5 \\ x^2+4x-1 \overline{) 2x^3+3x^2-8x+2} \\ \underline{-(2x^3+8x^2+2x)} \\ -5x^2-6x+2 \end{array}$$

$$y = 2x - 5$$

3. An engineer collects the following data showing the speed s of a Ford Taurus and its average miles per gallon, M .

- a. Draw a scatter plot of the data. Based on the scatter plot, what type of model does it look like you will use?

QUADRATIC & CUBIC are VERY SIMILAR. CUBIC HAS SLIGHTLY HIGHER R^2 VALUE

- b. Using your calculator/computer, find the model that best fits this data.

* CUBIC: $y = -0.0063x^3 + 0.020x^2 + 0.141x + 2.142$
 \rightarrow Best fit

Speed, s	Miles per Gallon, M
30	18
35	20
40	23
40	25
45	25
50	28
55	30
60	29
65	26
65	25
70	25

Quadratic: $y = -0.017x^2 + 1.935x - 25.341$

- c. Use the function found in part b to determine the speed that maximizes miles per gallon. This can be done on the graph on the calculator.

CUBIC: 56.404

Quad.: 55.378

- d. Use the function found in part b to predict miles per gallon for a speed of 63 miles per hour.

27.584 mpg.

27.212 (QUAD)

- e. Is the work in part d an example of interpolation or extrapolation?

Interpolation - 63 is within the data set.