

Math 150 Quiz 2

You have 15 minutes to finish this quiz. There is ONE problem, which consists of THREE parts (the third part is on the back). Show all your work clearly TO RECEIVE FULL CREDITS.

Please write down your name and session (9:30 or 10:30) at the top of this page.

$$\text{Let } f(x) = \frac{3x - 1}{x^2 - x - 12}.$$

a) Determine the domain and intercepts and test for symmetry.

Zeros of the bottom function:

$$\begin{aligned} x^2 - x - 12 &= 0 \\ (x - 4)(x + 3) &= 0 \\ x = 4, x = -3. \end{aligned}$$

So $D = \{x \neq 4, x \neq -3\}$.

x -intercepts: set the top function to zero and solve for x .

$$3x - 1 = 0 \quad \text{or} \quad x = \frac{1}{3}.$$

y -intercepts: find $f(0)$.

$$f(0) = \frac{3 \cdot 0 - 1}{0^2 - 0 - 12} = \frac{-1}{-12} = \frac{1}{12}.$$

So x -intercepts: $x = \frac{1}{3}$ or $(\frac{1}{3}, 0)$, y -intercepts: $y = \frac{1}{12}$ or $(0, \frac{1}{12})$.

Symmetry:

$$\begin{aligned} x\text{-axis : } y &\rightarrow (-y) \\ -y &= \frac{3x - 1}{x^2 - x - 12} \\ y &= -\frac{3x - 1}{x^2 - x - 12} && \text{no symmetry} \\ y\text{-axis : } x &\rightarrow (-x) \\ y &= \frac{3(-x) - 1}{(-x)^2 - (-x) - 12} \\ y &= \frac{-3x - 1}{x^2 + x - 12} && \text{no symmetry} \\ \text{origin : } x &\rightarrow (-x), y \rightarrow (-y) \\ -y &= \frac{3(-x) - 1}{(-x)^2 - (-x) - 12} \\ -y &= \frac{-3x - 1}{x^2 + x - 12} \\ y &= \frac{3x + 1}{x^2 + x - 12} && \text{no symmetry} \end{aligned}$$

b) Determine all the asymptotes (vertical, horizontal, oblique), if any.

Vertical asymptotes: zeros of the bottom $x = 4$, $x = -3$.

Horizontal or oblique asymptotes: $\deg(\text{top}) = 1$, $\deg(\text{bottom}) = 2$. $\deg(\text{top}) < \deg(\text{bottom})$, so the function has a horizontal asymptote $y = 0$.

c) Sketch the graph, making sure to include all the information found in parts a) and b).

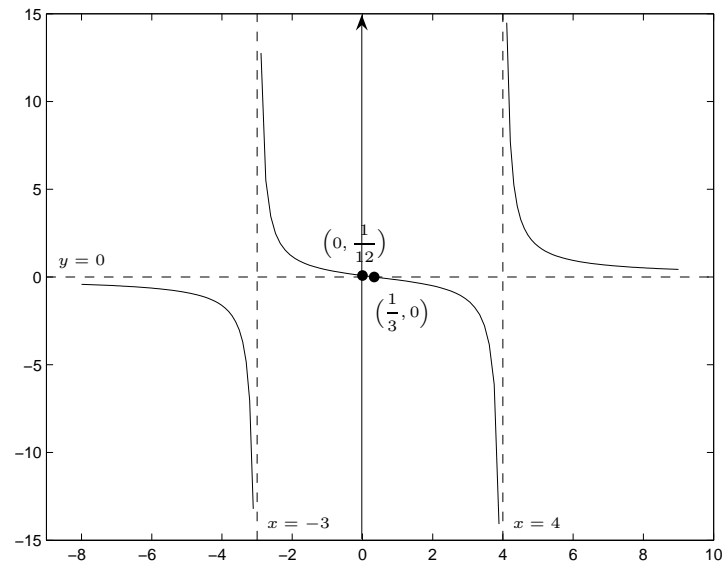


Figure 1: The rational function $f(x) = \frac{3x - 1}{x^2 - x - 12}$.