Practice Problems for Math Success

Rational Functions

These **practice problems** are designed to help you **prepare for our course exams** and **assess your understanding** of the course material at the expected level. Aim to complete them **in class, during tutoring, office hours, or on your own**, and try to solve them **without notes or a calculator**, just like on the **actual exams**. Remember, **practice makes perfect**, so don't hesitate to **ask for help** if you get stuck.

1. The graph of $y = f(x)$ has

   - One vertical asymptote, at $x = -2$.
   - A horizontal asymptote at $y = -3$.
   - The x-intercepts of f is 4.
   - The y-intercept is 6.

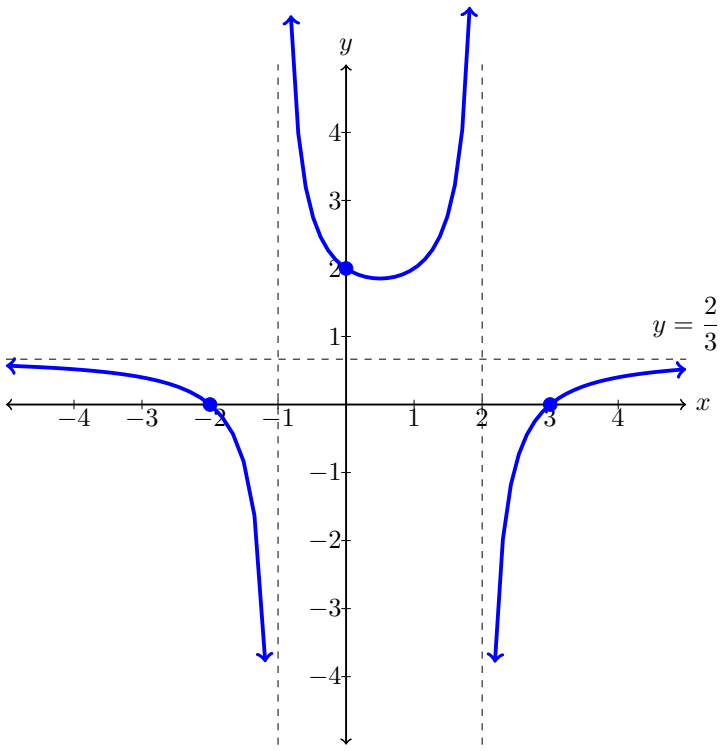
   Find ONE possible formula for the rational function f.

2. The graph of $y = f(x)$ has

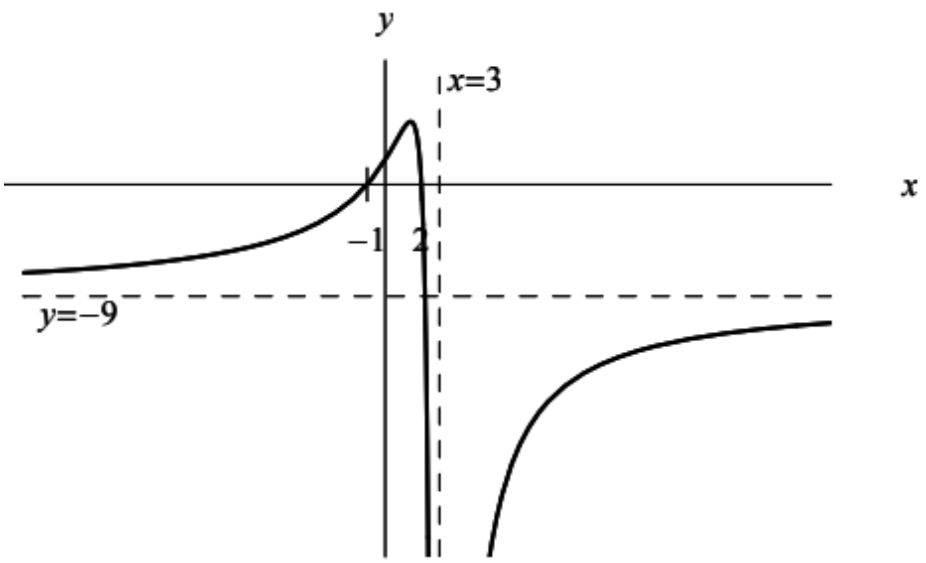
   - One vertical asymptote, at $x = 3$.
   - A horizontal asymptote at $y = -8$.
   - The x-intercepts of f are: 2 and 5.
   - The y-intercept is -80/9.

   Find ONE possible formula for the rational function f.

3. Find a possible formula for the rational function graphed below.



4. Find a possible formula for the rational function graphed below. Note that the points $(-1, 0)$ and $(2, 0)$ are on the graph.



5. For each of the following descriptions, select from the functions I–VI the one/ones which satisfies/satisfy it. There may be more than one function for each description, or none at all.

   (a) No x-intercept. ANSWER: _____

   (b) No horizontal asymptote. ANSWER: _____

   (c) Two zeros and one vertical asymptote. ANSWER: _____

   (d) Vertical asymptote at $x = -2$. ANSWER: _____

   (e) Horizontal asymptote at $y = 2$. ANSWER: _____

I. $y = \dfrac{x^4 - 4}{x^3 - 2x^2 + x - 2}$

II. $y = \dfrac{x^2 + 4}{x - 3}$

III. $y = \dfrac{(2x)^2 + 4}{x^2 + 4}$

IV. $y = \dfrac{2x^2 + x + 1}{x^2 + 2}$

V. $y = \dfrac{x^3 - 9x}{x + 2}$

VI. $y = \dfrac{x + 3}{x^2 - x - 6}$

6. Let $f(x) = x^2 - 4$, $g(x) = x^2 + 4$, and $h(x) = x + 5$. Match each of the functions, (I)-(VII) to one of the descriptions (a)-(e). Note that some functions may match none of the given descriptions. If no description matches, write "None".

(a) $y = \dfrac{f(x)}{g(x)}$ ANSWER: _____

(b) $y = \dfrac{h(x)}{f(x)}$ ANSWER: _____

(c) $y = f(\frac{1}{x})$ ANSWER: _____

(d) $y = \dfrac{g(x)}{h(x)}$ ANSWER: _____

(e) $y = f(x) \cdot g(x)$ ANSWER: _____

I. One zero at $x = -5$ and horizontal asymptote at $y = 0$.

II. No zeros, vertical asymptote at $x = -5$, no horizontal asymptote.

III. Zeros at $x = -5, x = 2, x = -2$.

IV. No zeros, vertical asymptotes at $x = -5$, horizontal asymptote at $y = 0$.

V. Two zeros, no vertical asymptotes, horizontal asymptote at $y = 1$.

VI. Horizontal asymptote at $y = -4$.

VII. No zeros, no vertical asymptotes, horizontal asymptote at $y = 1$.