



# Precalculus

## Topic: Rational Functions

### Instructions

Solve the following problems related to rational functions. Show all work clearly and check your solutions.

### Practice Problems

1. Find the domain of the following rational functions:

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

(iv)  $f(x) = \frac{x+4}{x^2+3x-18}$

(ii)  $f(x) = \frac{x^2-1}{x^2+2x-8}$

(v)  $f(x) = \frac{1}{x^2+x-12}$

(iii)  $f(x) = \frac{2x+3}{x^2+5x+6}$

2. Find the vertical asymptotes of the following rational functions:

(i)  $f(x) = \frac{2x+1}{x^2-9}$

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

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

(iii)  $f(x) = \frac{3x-5}{x^2+6x+9}$

(v)  $f(x) = \frac{5}{x^2+2x-3}$

3. Find the horizontal asymptotes of the following rational functions:

(i)  $f(x) = \frac{x^2+3x-4}{x^2+2x+5}$

(iv)  $f(x) = \frac{5x^3-2x}{x^3+4x^2+1}$

(ii)  $f(x) = \frac{2x^2-3x+1}{x^2-4x+2}$

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

(iii)  $f(x) = \frac{x^2-4}{2x^2+3x-5}$

4. Find the intercepts and asymptotes, and then sketch a graph of the rational function. State the domain and range.

(i)  $r(x) = \frac{4x-4}{x+2}$

(iv)  $t(x) = \frac{3x+6}{x^2+2x-8}$

(ii)  $r(x) = \frac{2x+6}{-6x+3}$

(iii)  $s(x) = \frac{18}{(x-3)^2}$

(v)  $t(x) = \frac{x^3-x^2}{x^3-3x-2}$

5. Find the slant asymptote, vertical asymptotes, and sketch a graph of the function.

(i)  $r(x) = \frac{x^2+2x}{x-1}$

(iii)  $r(x) = \frac{x^3+x^2}{x^2-4}$

(ii)  $r(x) = \frac{3x-x^2}{2x-2}$

(iv)  $r(x) = \frac{x^3+4}{2x^2+x-1}$

## Multiple-Choice Questions

- What is the domain of the rational function  $f(x) = \frac{x+5}{x^2-9}$ ?
  - $(-\infty, -3) \cup (-3, \infty)$
  - $(-\infty, 3) \cup (3, \infty)$
  - $(-\infty, -3) \cup (3, \infty)$
  - $(-\infty, 0) \cup (0, \infty)$
- What is the vertical asymptote of the function  $f(x) = \frac{3x-5}{x^2-4x+3}$ ?
  - $x = -1$
  - $x = 1$
  - $x = -3$
  - $x = 2$
- What is the horizontal asymptote of the rational function  $f(x) = \frac{3x^2+2x-1}{x^2-5x+7}$ ?
  - $y = 1$
  - $y = 2$
  - $y = 0$
  - No horizontal asymptote
- What are the x- and y-intercepts of the function  $r(x) = \frac{4x-4}{x+2}$ ?
  - $x = -2, y = 0$
  - $x = 0, y = 2$
  - $x = 2, y = 1$
  - No intercepts
- What is the simplified form of the rational expression  $\frac{6x^2-2x}{3x^2-9x}$ ?
  - $\frac{2x}{3x-9}$
  - $\frac{2x}{3(x-3)}$
  - $\frac{2x}{x-3}$
  - $\frac{2}{3x-9}$