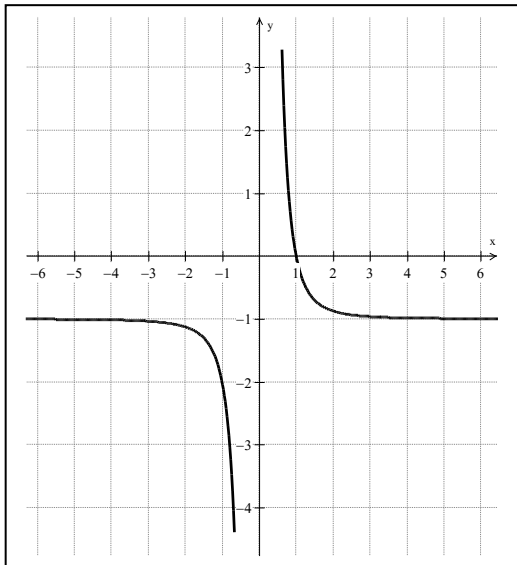


1. For the function, $y = f(x)$, state the asymptotes, domain, range, intervals of increase/decrease and the positive/negative intervals.



- a) Domain: _____
- b) Range: _____
- c) Vertical Asymptote: _____
- d) Horizontal Asymptote: _____
- e) Interval of Increase: _____
- f) Interval of Decrease: _____
- g) Positive Interval: _____
- h) Negative Interval: _____

2. For each of the following functions:

- i) State the equations of the Vertical Asymptotes and determine the End Behaviours of the graphs near the vertical asymptotes. State the x-coordinate of any hole in the graph.
- ii) State the equation of the Slant/Horizontal Asymptote and determine the End Behaviours of the graphs near the asymptotes.

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

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

3. For each of the following functions:

- i) State the x and y-intercepts.
- ii) State the equations of the Vertical Asymptotes and determine the End Behaviours of the graphs near the vertical asymptotes. State the x-coordinate of any hole in the graph.
- iii) State the equation of the Slant/Horizontal Asymptote and determine the End Behaviours of the graphs near the asymptotes.
- iv) Sketch the graph of each function.

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

b) $f(x) = \frac{x^3 - 8}{x^2 + x - 2}$

c) $f(x) = \frac{2x^2 + x}{2x^2 - 7x - 4}$

4. Solve.

a) $\frac{2x-1}{5x+3} < 0$

b) $\frac{2x+1}{x-4} > 3$

c) $\frac{3}{x} = \frac{4}{x^2 - 2x} - \frac{2}{x-2}$

d) $\frac{x+3}{x^2 + 2x - 3} \leq 0$

e) $\frac{2x+1}{x+2} + \frac{x^2+1}{x^2-x-6} = \frac{x-1}{x-3}$

f) $\frac{4}{x^2-9} - \frac{x}{x-3} = \frac{x-1}{x+3}$

Answers:

1. D: $\{x \in \mathbb{R} | x \neq 0\}$
R: $\{y \in \mathbb{R} | y \neq -1\}$
VA: $x = 0$
HA: $y = -1$
increase: none
decrease: $(-\infty, 0), (0, \infty)$
positive: $(0, 1)$
negative: $(-\infty, 0), (1, \infty)$

2. a) i) VA: $x = -3$ EB: $x \rightarrow -3^+, y \rightarrow +\infty$
 $x \rightarrow -3^-, y \rightarrow -\infty$

- ii) SA: $y = x - 5$ EB: $x \rightarrow +\infty, \text{above}$
 $x \rightarrow -\infty, \text{below}$

3. a) i) x-intercept: $\frac{1}{2}, \frac{-1}{2}$ y-intercept: 1
ii) VA: $x = 1$ EB: $x \rightarrow 1^+, y \rightarrow +\infty$
 $x \rightarrow 1^-, y \rightarrow -\infty$

- iii) HA: $y = 0$ EB: $x \rightarrow +\infty, \text{above}$
 $x \rightarrow -\infty, \text{below}$

- c) i) x-intercept: 0 y-intercept: 0

- ii) Hole at $x = -\frac{1}{2}$
VA: $x = 4$ EB: $x \rightarrow 4^+, y \rightarrow +\infty$
 $x \rightarrow 4^-, y \rightarrow -\infty$

- ii) HA: $y = 1$ EB: $x \rightarrow +\infty, \text{above}$
 $x \rightarrow -\infty, \text{below}$

4. a) $-\frac{3}{5} < x < \frac{1}{2}$
d) $x < -3$ or $-3 < x < 1$

- b) $4 < x < 13$
e) $x = 0$

- b) i) Hole at $x = -2$
VA: $x = -3$ EB: $x \rightarrow -3^+, y \rightarrow -\infty$
 $x \rightarrow -3^-, y \rightarrow +\infty$

- ii) HA: $y = 2$ EB: $x \rightarrow +\infty, \text{below}$
 $x \rightarrow -\infty, \text{above}$

- b) i) x-intercept: 2 y-intercept: 4
ii) VA: $x = -2$ EB: $x \rightarrow -2^+, y \rightarrow +\infty$
 $x \rightarrow -2^-, y \rightarrow -\infty$

- VA: $x = 1$ EB: $x \rightarrow 1^+, y \rightarrow -\infty$
 $x \rightarrow 1^-, y \rightarrow +\infty$

- iii) SA: $y = x - 1$ EB: $x \rightarrow +\infty, \text{above}$
 $x \rightarrow -\infty, \text{below}$

- c) no solution
f) 1 or $-\frac{1}{2}$