

B. Rational Functions Solutions

1a) no x -int, $y = 1/3$ b) $x = 2, y = -2$ c) $x = 1, \text{ no } y\text{-int}$ d) $x = -3, y = 3$

2. a) x -axis b) x -axis c) $x = 3/2$

3. a) $x = -4$ b) $x = +/- 1$ c) $x = 3$ (discontinuous at $x = -2$)

4. a) $x = 0, \text{ No vertical}$ b) $x = -5, y = x - 6$ c) $x = -5, y = -x + 5$

5. a) i) No intercepts, Asymptotes: $x = 0, y = x + 1$ ii) $y = \frac{x^2 + 1}{x}$

b) i) y -int $y = 1$; Asymptotes: $y = 1, x = +/- 1$ ii) $y = -\frac{x^2 + 1}{x^2 - 1}$

6.

	Asymptotes	Intercepts	Intervals of increase	Intervals of decrease	Domain	Range
a)	$x = -5, y = 0$	$y = -1, x = 5$	None	$x < -5, x > -5$	$x \neq 5$	$y \neq 0$
b)	$y = 0$	$y = -2$	$x > 0$	$x < 0$	$x \in \mathfrak{R}$	$y < 0$
c)	$x = 0, y = 2x$	None	$x < -1.22$ $x > 1.22$	$-1.22 < x < 0$ $0 < x < 1.22$	$x \neq 0$	$y < -4.9, y > 4.9$
d)	$x = 1, y = -x - 1$	None, $y = -2$	$-0.73 < x < 1$ $1 < x < 2.73$	$x < 0.73$ $x > 2.74$	$x \neq 1$	$y < -5.46, y > 1.46$

7. $f(x) = (x+1)(x-4)$, Vertical Asymptotes $x = -1, 4$, $y = \frac{1}{(x+1)(x-4)}$

8.

	Asymptotes	Intercepts	Domain	Range
a)	$x = 6, y = -5$	$x = 0, y = 0$	$x \neq 6$	$y > 5$
b)	$x = 5, y = 0$	None	$x \neq 5$	$y \in \mathfrak{R}$
c)	$y = 0$	$y = \frac{1}{3}$	$x \in \mathfrak{R}$	$0 < y \leq \frac{1}{3}$

9. a) $x \leq -3, -2 \leq x \leq 1.7, x \geq 4$

b) $x \leq -4, -1 < x < 4, x \geq 5$

10. Average Rate = 2.04, Instantaneous Rate = 2.02

11. b) The graph increases for sales greater than zero but eventually reaches a maximum of 600 (as there is a horizontal asymptote)

c) At 100 t, the profit increase by 1.87/tonne. At 500 t, the profits increase by 0.208/tonne. Therefore there is less of a profit increase as the tonnes sold increases