

SOLUTION KEY

MATH110

Quiz2

Section005

1 (2.5 pts) A manufacturer has a monthly fixed cost of \$40,000 and a production cost of \$8 for each unit produced. The product sells for \$12/unit.

- (a) What is the cost function?
- (b) What is the revenue function?
- (c) What is the profit function?

Solution. Let x be the quantities to be sold.

For (a). The cost function is $C(x) = 8x + 40000$.

For (b). The revenue function is $R(x) = 12x$.

For (c). The profit function is $P(x) = R(x) - C(x) = 12x - (8x + 40000) = 4x - 40000$.

2 (2.5 pts) Find the indicated limit.

$$\lim_{x \rightarrow 2} \frac{2x + 1}{x + 2}$$

Solution.

$$\lim_{x \rightarrow 2} \frac{2x + 1}{x + 2} = \frac{2 \cdot 2 + 1}{2 + 2} = \frac{5}{4}$$

3(2.5 pts) Find the indicated limit, if it exists.

$$\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1}$$

Solution. It is of the form $\frac{0}{0}$. We will factorize the numerator to find the limit.

$$\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1} = \lim_{x \rightarrow 1} \frac{(x - 1)(x + 1)}{x - 1} = \lim_{x \rightarrow 1} (x + 1) = 1 + 1 = 2.$$

4(2.5 pts) Find the indicated limit, if it exists.

$$\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1}$$

Solution. It is also of the form $\frac{0}{0}$. We will rationalize the numerator, say, multiply both the numerator and the denominator by $\sqrt{x} + 1$.

$$\begin{aligned} \lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1} &= \lim_{x \rightarrow 1} \frac{(\sqrt{x} - 1)(\sqrt{x} + 1)}{(x - 1)(\sqrt{x} + 1)} = \lim_{x \rightarrow 1} \frac{x - 1}{(x - 1)(\sqrt{x} + 1)} \\ &= \lim_{x \rightarrow 1} \frac{1}{\sqrt{x} + 1} = \frac{1}{\sqrt{1} + 1} = \frac{1}{2}. \end{aligned}$$