Solution Key

MATH110 **Quiz2** **Section009**

1 (2.5 pts) Find the constants m and b in the linear function $f(x) = mx + b$ so that $f(0) = 2$ and $f(3) = 4$.
Solution. Evaluating f at $x = 0$ gives $f(0) = m \cdot 0 + b = b$ and so $b = 2$. Similarly, $4 = f(3) = m \cdot 3 + 2 = 3m + 2$. Solving $3m + 2 = 4$, we have

$$\begin{aligned} 3m + 2 &= 4 \\ 3m &= 2 \\ m &= 2/3. \end{aligned}$$

2 (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 $C(x) = 8x + 40,000$.
For (b). The revenue function is $R(x) = 12x$.
For (c). The profit function is $P(x) = R(x) - C(x) = 12x - (8x + 40,000) = 4x - 40,000$.

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

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

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

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

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

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

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

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