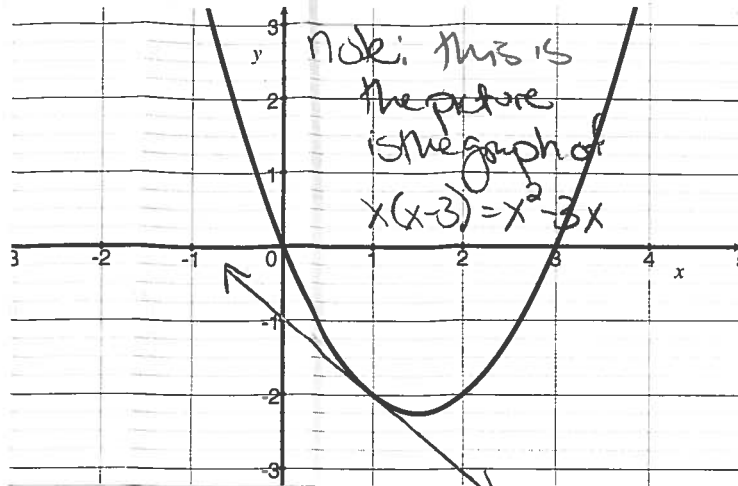


TMATH 124: Quiz 2

Key

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. No credit is given without supporting work.

1. (WebHW5 #3) Let $f(x) = 7x - x^2$ whose graph is shown to the right.



- (a) [1] Estimate $f'(1)$.

picture ~ -1 should be 5

- (b) [2] Find (exactly) the slope of the line tangent to the graph of f when $x = 1$.

$$\begin{aligned} & \lim_{h \rightarrow 0} \frac{f(1+h) - f(1)}{h} \quad \text{+5} \\ &= \lim_{h \rightarrow 0} \frac{[7(1+h) - (1+h)^2] - [7(1) - 1^2]}{h} \quad \text{+1} \\ &= \lim_{h \rightarrow 0} \frac{7 + 7h - 1 - 2h - h^2 - 6}{h} \\ &= \lim_{h \rightarrow 0} \frac{5h - h^2}{h} = \lim_{h \rightarrow 0} \frac{h(5-h)}{h} = \lim_{h \rightarrow 0} (5-h) = 5 \end{aligned}$$

$$\begin{aligned} & \text{or } \lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x-1} \quad \text{+5} \\ &= \lim_{x \rightarrow 1} \frac{[7x - x^2] - [7(1) - 1^2]}{x-1} \quad \text{+1} \\ &= \lim_{x \rightarrow 1} \frac{7x - x^2 - 6}{x-1} \\ &= \lim_{x \rightarrow 1} \frac{(x-1)(-x+6)}{x-1} \\ &= \lim_{x \rightarrow 1} (-x+6) = -1+6 = 5 \end{aligned}$$

- (c) [2] Find the equation of the line tangent to the graph of f when $x = 1$.

+5 Looking for $y = mx + b$

$$\begin{aligned} & \text{+5 } \left\{ \begin{aligned} m &= \text{slope of line tangent to } f \text{ @ } x=1 \\ &= \text{what we did in part (b)} \\ &= 5 \end{aligned} \right. \end{aligned}$$

$$\text{+5 } \left\{ \begin{aligned} & \text{Since the line passes thru the point} \\ & (1, f(1)) = (1, 7(1) - 1^2) = (1, 6) \end{aligned} \right.$$

$$\begin{aligned} & \text{+5 } \left\{ \begin{aligned} \text{so } 6 &= 5(1) + b \\ \Rightarrow 6 - 5 &= 1 = b \\ \text{so } y &= 5x + 1 \end{aligned} \right. \end{aligned}$$

or Looking for $y - y_1 = m(x - x_1)$

$$\begin{aligned} & m = \text{slope of line tangent to } f \text{ @ } x=1 \\ &= \text{what we did in part (b)} \\ &= 5 \end{aligned}$$

$$\text{Since the line passes thru } (1, f(1)) = (1, 7(1) - 1^2) = (1, 6)$$

$$y - 6 = 5(x - 1)$$