

5. (12 points) Let  $f(x) = x - x^2$ .

(i) Use the limit definition of the derivative to calculate  $f'(x)$ .

(ii) Find the equation of the line tangent to the graph of  $f(x)$  at  $(1,0)$ .

$$\begin{aligned} \text{i) } f'(x) &= \lim_{h \rightarrow 0} \frac{x+h - (x+h)^2 - (x-x^2)}{h} \\ &= \lim_{h \rightarrow 0} \frac{h - 2xh - h^2}{h} = \lim_{h \rightarrow 0} 1 - 2x - h = 1 - 2x \end{aligned}$$

$$\text{ii) } m = f'(1) = -1$$

$$\text{so } y - 0 = -1(x - 1)$$

$$\text{i.e. } y = -x + 1$$