

Practice Problems Quiz Review 2.1

Ex. Find derivative function for $f(x) = x^2 - x + 1$

- (a) Find equation of tangent line at $x = -1$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{(x+h)^2 - (x+h) + 1 - (x^2 - x + 1)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 - x - h + 1 - x^2 + x - 1}{h}$$

$$\lim_{h \rightarrow 0} \frac{h(2x + h - 1)}{h} = 2x + 0 - 1$$

$$f'(x) = 2x - 1$$

$$f(-1) = 1 + 1 + 1 = 3$$

$$f'(-1) = -2 - 1 = -3$$

point: $(-1, 3)$ slope: $m = -3$

$$y - 3 = -3(x + 1)$$

Ex. 2 $f'(c) = \lim_{x \rightarrow 9} \frac{2\sqrt{x} - 6}{x - 9}$

Alt. Def.
 $f'(c) = \lim_{x \rightarrow c} \frac{f(x) - f(c)}{x - c}$

Find $f(x)$ and c .

Find value of $f'(c)$

$$f(x) = 2\sqrt{x}$$

$$f(c) = 6 \rightarrow f(9) = 2\sqrt{9} = 2 \cdot 3 = 6$$

$$f'(9) = \lim_{x \rightarrow 9} \frac{2\sqrt{x} - 6}{x - 9} \cdot \frac{2\sqrt{x} + 6}{2\sqrt{x} + 6} = \frac{4x - 36}{(x - 9)(2\sqrt{x} + 6)} = \lim_{x \rightarrow 9} \frac{4(x - 9)}{(x - 9)(2\sqrt{x} + 6)} = \frac{4}{6 + 6} = \frac{4}{12} = \frac{1}{3}$$

point: $(9, 6)$

$$m = \frac{1}{3}$$

$$y - 6 = \frac{1}{3}(x - 9)$$

$x^2 - x$ \bullet $f'(2)$ using

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

(3)