

CONTINUED

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# FINDING THE DERIVATIVE (SLOPE FUNCTION)

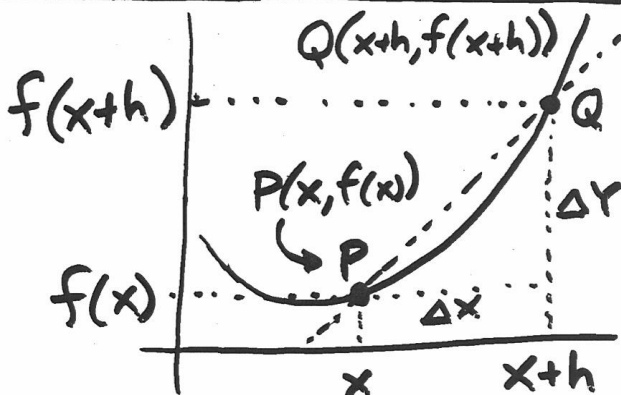
SEE PICTURE

P. 85

LET  $h \rightarrow 0$

$h = .0000 \dots$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$



I  $(x, f(x))$

II  $(x+h, f(x+h))$

$m_{\text{tan}} = \text{SLOPE FUNCTION} = f'(x)$

$$f'(x) = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(x+h) - f(x)}{(x+h) - x}$$

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

$$f'(x) = \frac{dy}{dx} = \frac{df}{dx} = D_x(f) = \frac{d}{dx}(f)$$

EXAMPLE A: POLYNOMIAL FUNCTIONS  
LIKE p. 88 → 9, 10, 12

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$$y = -3x^2 + 4x$$

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

$$\lim_{h \rightarrow 0} \frac{-3(x+h)^2 + 4(x+h) - (-3x^2 + 4x)}{h} =$$

$$\lim_{h \rightarrow 0} \frac{-3(x^2 + 2xh + h^2) + 4x + 4h + 3x^2 - 4x}{h} =$$

$$\lim_{h \rightarrow 0} \frac{-3x^2 - 6xh - 3h^2 + 4x + 4h + 3x^2 - 4x}{h} =$$

$$\lim_{h \rightarrow 0} \frac{-6xh - 3h^2 + 4h}{h} = \lim_{h \rightarrow 0} \frac{h(-6x - 3h + 4)}{h}$$

$$= \lim_{h \rightarrow 0} -6x - 3h + 4$$

$$\boxed{f'(x) = -6x + 4}$$
  
SLOPE FUNCTION

FIND SLOPE OF  $f(x)$  AT  $x = 3$ .

$$f'(3) = -6(3) + 4 = -18 + 4 \quad \boxed{f'(3) = -14}$$

FIND EQUATION OF TANGENT LINE AT  $x = 3$

$$y - y_1 = m(x - x_1)$$

$$f(3) = -3 \cdot 3^2 + 4 \cdot 3$$

$$y - -15 = -14(x - 3)$$

$$\leftarrow f(3) = -15$$

$$y + 15 = -14x + 42$$

$$\boxed{y = -14x + 27}$$

FIND EQUATION OF THE NORMAL  
LINE AT  $X=3$

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⌥ PERPENDICULAR

$$Y - Y_1 = m(X - X_1)$$

$$m_{\text{tan}} = -14$$

(OPPOSITE RECIPROCAL  $\rightarrow m_{\text{norm}} = \frac{1}{14}$ )

$$Y - -15 = \frac{1}{14}(X - 3) \quad Y + 15 = \frac{1}{14}X - \frac{3}{14}$$

T1-89

$$Y = \frac{1}{14}X - 15\frac{3}{14}$$

$$Y1 = -3X^2 + 4X$$

◇ F3

F5

A TANGENT

ENTER

3 ENTER

NOT ON TEST !!

HWORK  $\rightarrow$  p.88  $\rightarrow$  9, 10, 12, 19, 22, 29

REVIEW ASSIGNMENT FOR CHAP. 2  
TEST

$\rightarrow$  p.91-93

$\rightarrow$  1, 3, 5, 7, 9, 13, 15, 17, 19, 25,

31, 33, 34, 37, 38, 39, 40, 43,

45, 47, 52 & p.63  $\rightarrow$  43, 44

⌥ \*\*\*\*\*