

AP Calculus AB 3.1 – 3.4 Test Review

1. a) Using the Power Rule, find the derivative of $f(x) = 3x^2 - 2x + 1$. _____

b) Obtain the same answer to part a) by using the formal limit definition of a derivative.

2. Differentiate $y = \frac{3x}{x^2 + 1}$ _____

3. Find $\frac{dy}{dx}$ for $y = \sqrt{x}(3x-1)$ _____

4. Find $\frac{d^2y}{dx^2}$ for $y = \frac{x+2}{x-3}$ _____

5. Find the equation of a) the line tangent to and b) the line normal to the graph of $f(x) = -2x^2 + 2x + 3$ at the point where $x=1$.
5a. _____

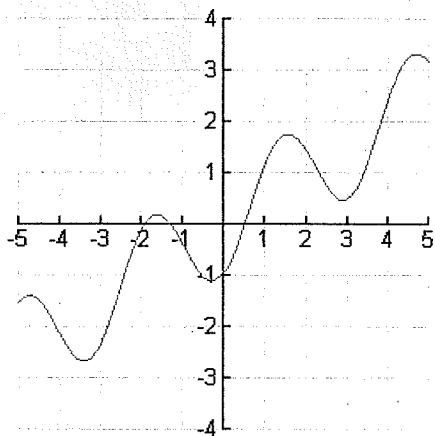
5b. _____

6. Find the points on the graph of $f(x) = x^3 - 2$ where the slope is 3. _____

7. Find the instantaneous rate of change of w with respect to j for $w = \frac{1}{j} + \frac{j}{2}$. _____

8. Suppose the position function for a moving object is given by $s(t) = 9t^3 + 2t^2 - 18t + 4$ where s is measured in meters and t is measured in seconds. Find the acceleration of the object when $t = 3$.

9. Given this graph of $f(x)$, graph its derivative on the same set of axes:



* Understand both quizzes from this chapter --- even questions which may not have * appeared here on the review.

$$1a) f(x) = 3x^2 - 2x + 1$$

$$f'(x) = 6x - 2$$

$$1b) \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h} = \frac{3(a+h)^2 - 2(a+h) + 1 - (3a^2 - 2a + 1)}{h}$$

$$\frac{3a^2 + 6ah + 3h^2 - 2a - 2h + 1 - 3a^2 + 2a - 1}{h}$$

$$\lim_{h \rightarrow 0} \frac{6ah + 3h^2 - 2h}{h} = \lim_{h \rightarrow 0} 6a + 3h - 2 = 6a - 2$$

$$2) y' = \frac{(x^2+1)(3) - (3x)(2x)}{(x^2+1)^2}$$

$$3) \frac{dy}{dx} \quad \begin{array}{l} \sqrt{x} (3x-1) \\ x^{\frac{1}{2}} (3x-1) \quad *Distribute \\ 3x^{\frac{3}{2}} - x^{\frac{1}{2}} \end{array}$$

$$\frac{dy}{dx} = \frac{9}{2}x^{\frac{1}{2}} - \frac{1}{2}x^{-\frac{1}{2}}$$

$$4) \frac{dy}{dx} = \frac{(x-3)(1) - (x+2)(1)}{(x-3)^2}$$

$$= \frac{x-3-x-2}{(x-3)(x-3)}$$

$$= \frac{-5}{x^2-6x+9}$$

$$\frac{d^2y}{dx^2} = \frac{(x^2-6x+9)(0) - (-5)(2x-6)}{(x^2-6x+9)^2}$$

$$= \frac{10x-30}{(x^2-6x+9)^2}$$

$$\textcircled{5} \quad f(x) = -2x^2 + 2x + 3$$

$$f'(x) = -4x + 2$$

$$f'(1) = -4 + 2 = -2$$

$$a) \quad y - \underline{3} = -2(x - 1)$$

$$b) \quad y - \underline{3} = -\frac{1}{2}(x - 1)$$

$$f(1) = -2(1^2) + 2 + 3$$

$$= -2 + 2 + 3$$

$$= 3$$

$\textcircled{6}$ Take deriv & set it equal to 3

$$f'(x) = 3x^2$$

$$3x^2 = 3$$

$$x^2 = 1$$

$$x = 1 \quad x = -1$$

Find points
(plug x's into
original to find
y's)

$$(1, -1)$$

$$(-1, -3)$$

$$\textcircled{7} \quad w = j^{-1} + \frac{1}{2}j$$

$$w' = -j^{-2} + \frac{1}{2} \quad \text{or} \quad \frac{-1}{j^2} + \frac{1}{2}$$

$$\textcircled{8} \quad s(t) = 9t^3 + 2t^2 - 18t + 4$$

$$v(t) = 27t^2 + 4t - 18$$

$$a(t) = 54t + 4$$

$$a(3) = 54(3) + 4$$

$$= 162 + 4 = \underline{166}$$

