Math 1181H (§110) – Sept. 7, 2018 Full Name: ____________________

Quiz 1

NOTE: Answers without proper justification will receive NO credit

Problem 1. *(3 points)* Find the equation of the tangent line to the curve $y = (x^3 - x^2 + 1)^8$ at the point $(1, 1)$.

Slope $= y'(1)$. $\quad y'(x) = 8(x^3 - x^2 + 1)^7 (3x^2 - 2x)$

$y'(1) = 8(1 - 1 + 1)^7 (3 - 2) = 8$

So the line has equation.

$$\boxed{y = 8(x-1) + 1}$$

Problem 2. *(2 points)* State and prove the additive law for derivatives by using the definition.

If f & g differentiable, then $f+g$ is differentiable & $(f+g)' = f' + g'$.

Why?
$$(f+g)' = \lim_{\Delta x \to 0} \frac{(f+g)(x+\Delta x) - (f+g)(x)}{\Delta x}$$
$$= \lim_{\Delta x \to 0} \frac{f(x+\Delta x) + g(x+\Delta x) - f(x) - g(x)}{\Delta x}$$
$$= \lim_{\Delta x \to 0} \Bigg(\underbrace{\frac{f(x+\Delta x) - f(x)}{\Delta x}}_{\downarrow \Delta x \to 0 \;\; f'(x)} + \underbrace{\frac{g(x+\Delta x) - g(x)}{\Delta x}}_{\downarrow \Delta x \to 0 \;\; g'(x)} \Bigg)$$

So by Additive Limit Law

$= f'(x) + g'(x)$ as we wanted.