Quiz 8

Name: _____

1. Find the derivative function for the function $f(x) = 3x^2 + x$ using the definition of the derivative. [No points will be given for quoting the result from class or using a shortcut.]

$$\begin{aligned} f'(x) &= \lim_{h\to 0} \frac{f(x+h) - f(x)}{h} \\ &= \lim_{h\to 0} \frac{3(x+h)^2 + (x+h) - (3x^2 + x)}{h} \\ &= \lim_{h\to 0} \frac{3x^2 + 6xh + 3h^2 + x + h - 3x^2 - x}{h} \\ &= \lim_{h\to 0} \frac{6xh + h + 3h^2}{h} \\ &= \lim_{h\to 0} 6x + 1 + 3h \\ &= 6x + 1. \end{aligned}$$

2. Using the result from part 1, find the equation of the tangent line to $f(x)$ at $x = 2$. The slope is $m = f'(2) = 13$. The y-value is $y = f(2) = 14$. So,

$$14 = 13(2) + b$$

which gives $b = 14 - 26 = -12$. The equation is then

$$y = 13x - 12.$$