MAT 136 (Calculus I), Sept 27 Quiz, Prof. Jim Swift

No notes, no computers. Do your own work. Name: key

Answers with a sentence, as in $f'(x) = \cdots$ or "An equation of the tangent line is $\cdots$."

1. Find the derivative of $f(x) = 3x^2 - 5x + 6$.

$f'(x) = 6x - 5$

2. Find the derivative of $g(x) = \dfrac{3x+1}{2x+1}$. Simplify the numerator in your answer.

$$g'(x) = \frac{\frac{d}{dx}[3x+1]\cdot(2x+1) - (3x+1)\frac{d}{dx}[2x+1]}{(2x+1)^2}$$

$$= \frac{3\cdot(2x+1) - (3x+1)\cdot 2}{(2x+1)^2}$$ ← It's OK to skip to here, If you do it correctly.

$$= \frac{6x+3-(6x+2)}{(2x+1)^2} = \boxed{\frac{1}{(2x+1)^2}}$$

3. Let $f(x) = x^2 - x$. Find an equation of the tangent line to $y = f(x)$ at $x = 3$.

use $y = m(x - x_0) + y_0$, $x_0 = 3$, $y_0 = f(3) = 3^2 - 3 = 9 - 3 = 6$

so $(x_0, y_0) = (3, 6)$

slope $m = f'(3)$.

$f'(x) = 2x - 1$, so $f'(3) = 2 \cdot 3 - 1 = 6 - 1 = 5$

An equation of the tangent line is $\boxed{y = 5(x - 3) + 6}$

Another method: use $y = mx + b$.

$f'(3) = m = 5$ so $y = 5x + b$

plug in $x = 3$, $y = 6 = f(3)$.

$6 = 5 \cdot 3 + b$, $b = 6 - 15 = -9$, so $\boxed{y = 5x - 9}$

This "$mx + b$" form is not as useful in calculus.