

Quiz 4: Derivative Shortcuts (§3.2-3.3)

Directions: You have 40 minutes to complete this quiz. Open resources and you may collaborate. Draw graphs carefully (it's OK if you have to erase and redraw!).

1. Given $f(x) = -3x^2 + 2$, find the equation of the tangent line at $x = 1$. Then, draw a well-labeled graph that includes $f(x)$ and your tangent line on the same axes.

2. Suppose the derivative of the function f exists and assume $f(3) = 1$ and $f'(3) = 4$.
Let $g(x) = x^2 + f(x)$. Find an equation of the line tangent to $y = g(x)$ at $x = 3$.

3. Using the following information:

$$f(2) = 1 \quad f'(2) = 2 \quad g(2) = 5 \quad g'(2) = 3$$

compute $\frac{d}{dx} \left(\frac{xf(x)}{g(x)} \right) \Big|_{x=2}$.

4. Given the function $f(t) = 6\sqrt{t} - 4t^3 + 9$, we can compute its derivative, showing every step, as follows:

$$\begin{aligned} f'(t) &= \frac{d}{dt}(6\sqrt{t}) + \frac{d}{dt}(-4t^3) + \frac{d}{dt}9 && \text{(Sum Rule)} \\ &= 6\frac{d}{dt}\sqrt{t} - 4\frac{d}{dt}t^3 + 0 && \text{(Constant Multiple + Constant Rule)} \\ &= 6\left(\frac{1}{2}t^{-\frac{1}{2}}\right) - 4(3t^2) && \text{(Power Rule)} \\ &= \frac{3}{\sqrt{t}} - 12t^2 && \text{(Simplify)} \end{aligned}$$

Using the back of the page if necessary, compute the derivative of

$$y = \frac{w^4 + 5we^{\frac{1}{4}w} + 1}{w^2}$$

using the same format for your work. (In other words, show. Every. STEP.)