Worksheet 04

Instructor: Hong Chen **Topics:** Sections 3.2–3.3 and 3.7

Due: Sunday, October 25, at 11:59 p.m. **Submit:** Gradescope

Show your work and explain your reasoning. Worksheets are assessed for completion.

Derivative rules and tangent lines

1. Find the derivative of each function. Rewrite radicals and reciprocals as powers when helpful.

(a) $f(x) = 3\sqrt{x} + \dfrac{2}{x} - \dfrac{1}{x^2}, \quad x > 0$

(b) $g(x) = e^2(x^2 - 3x) + 2e^x$

2. Find the derivative of each function.

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

(b) $q(x) = \dfrac{x^2 + 1}{x + 2}, \quad x \neq -2$

(c) Find an equation of the tangent line to $y = q(x)$ at $x = 0$.

Compositions and the chain rule

3. Identify the inner and outer functions, and find the derivative of each function.

(a) $y = (2t^3 - t + 1)^4$

(b) $y = \dfrac{1}{\sqrt{x^2 + 4}}$

(c) $y = e^{x^2 - 2x}$

(d) $y = \left(\dfrac{x+2}{x-2}\right)^5, \quad x \neq 2$

Derivatives from a table

4. Let f and g be differentiable on $\mathbb{R}$, with the values below. Find each indicated derivative.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
0	2	1	-1	3
1	-1	2	4	-2
2	3	-1	5	1

(a) $(fg)'(1)$

(b) $(f/g)'(1)$

(c) $h'(0)$, where $h(x) = f(g(x))$

(d) $k'(0)$, where $k(x) = g(f(x))$