Worksheet 05

Instructor: Hong Chen **Topics:** Sections 3.5–3.8

Due: Sunday, November 1, 2026, at 11:59 p.m. **Submit:** Gradescope

Chain rule and trigonometric derivatives

1. Find the derivative of each function.

(a) $f(x) = \dfrac{1}{\sqrt{1+x^4}}$

(b) $g(x) = e^{\cos(2x)}$

(c) $h(x) = x\sin(3x)$

(d) $k(x) = \dfrac{\cos x}{1+x^2}$

A tangent line

2. Let $p(x) = x\cos x$.

(a) Find $p'(x)$.

(b) Find an equation of the tangent line to $y = p(x)$ at $x = \pi/2$.

Higher derivatives

3. Compute the indicated higher derivatives.

(a) For $u(x) = x^4 - 3x^2 + 1$, find $u''(x)$ and $u'''(x)$. What is the smallest positive integer n for which $u^{(n)}(x) = 0$ for every x?

(b) For $v(x) = \cos(2x)$, find $v''(x)$ and $v'''(x)$.

Implicit differentiation

4. Consider the ellipse $x^2 + 4y^2 = 20$ near the point $P = (2, 2)$.

(a) Differentiate implicitly to find dy/dx in terms of x and y.

(b) Find an equation of the tangent line at P.