MIDTERM II

1. Find \( \frac{dy}{dx} \) if A) \( y = \pi^3 \), B) \( y = -3x^{-8} + 2\sqrt{x} \).

2. Find \( \frac{d^2y}{dx^2} \) if \( y = 7x^3 - 5x^2 + x \).

3. Find the derivative of \( y = 3x^2 - 2x \) using the definition of the derivative.

4. Let \( f(2) = -2 \) and \( f'(2) = -1 \), and let \( g(x) = x^2 + x^3 f(x) \). Find \( g'(2) \).

5. Find the derivative of A) \( y = \sec x \tan x \), B) \( y = \frac{5-\cos x}{5+\sin x} \).

6. Let \( f(x) = \frac{1}{x} \). Find A) the average rate of change of \( f(x) \) over the interval \([1, 3]\), B) the instantaneous rate of change of \( f(x) \) at \( x = 2 \), C) an equation for the tangent line to \( y = f(x) \) at \( x = 2 \).

7. Find A) \( \frac{d^2}{dx^2} x \cos x \), B)(bonus) \( \frac{d^{11}}{dx^{11}} x \cos x \).