Final Exam

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Problem 1

Use the definition of derivatives to find $f'(x)$, and then find the tangent line to the graph of $y = f(x)$ at $x = 1$

$$f(x) = 3x^2 + 4x + 5$$

Problem 2

Find $f'(x)$.

$$f(x) = \frac{x^7}{3} - \frac{6x^5}{7} - \frac{1}{\sqrt{x}} + x + 2024$$

$$f(x) = (\sqrt[3]{x} + 1)(x^2 + 1)$$

$$f(x) = \frac{3x - 1}{3x + 1} \quad \text{(Simplify your answers.)}$$

$$f(x) = x^2 \sin x$$

$$f(x) = \frac{x^2}{\cos x}$$

$$f(x) = \tan^{2024} x$$

$$f(x) = \sin(2x^4 + x)$$

$$f(x) = \cos\left(\sin x + \cos x\right)$$

$$f(x) = \left(\cos x + \sin x\right)^2$$

$$f(x) = 2^x + 5^x - 2\log_2 x + 5\ln x - \frac{3\log_2 x}{5} + \frac{\log_7 x}{3} + 1$$

$$f(x) = \ln\left(x^2 + x + \sin x\right)$$

$$f(x) = 2^{\sin x + \cos x}$$

$$f(x) = e^{x\tan x}$$

Problem 3

$$y + x^2y - x^3 = 1$$

(a) Find dy/dx or y' by differentiating implicitly.

(b) Solve the equation for y as a function of x, and find dy/dx from that equation.

(c) Write an equation for the tangent line at the point $(0, 1)$