

M408C: Problem Set 4

Problem 1

Find an equation of the tangent line to the curve at the given point:

$$y = 4x - 3x^2 \text{ at } (2, -4), \quad y = \sqrt{x} \text{ at } (1, 1).$$

Problem 2

Let P represent the percentage of Austin's electrical power is the produced by solar panels t years after January 1, 2000.

1. What does $\frac{dP}{dt}$ represent in this context?
2. Interpret the statement

$$\left. \frac{dP}{dt} \right|_{t=2} = 3.5.$$

Problem 3

Differentiate the following functions:

$$f(x) = e^x + x^3, \quad f(x) = \frac{5}{x^3}, \quad f(x) = \frac{\sqrt{x} + x}{x^2}.$$

Problem 4

Differentiate the following functions:

$$f(x) = \frac{x}{e^x}, \quad f(x) = \frac{x^2 + 1}{x^3 - 1}, \quad f(x) = \frac{e^x}{1 - e^x}.$$

Problem 5

Use the product rule to show that

$$(fgh)' = f'gh + fg'h + fgh'.$$