

M408C: Problem Set 6

Problem 1

- Given the equation $\cos(xy) = 1 + \sin(y)$, use implicit differentiation to find y' as a function of x and y .
- Differentiate e^{x^2-x} .

Problem 2

Differentiate the following functions:

$$f(x) = x \ln(x) - x, \quad f(x) = \sin(\ln(x)), \quad f(x) = \frac{1}{\ln(x)}.$$

Problem 3

A population of protozoa develops with a constant relative growth rate of 0.7944 per member per day. On day zero the population consists of two members. Find the population size after six days.

Problem 4

A freshly brewed cup of coffee has temperature $95^\circ C$ in a $20^\circ C$ room. When its temperature is $70^\circ C$, its cooling a rate of $1^\circ C$ per minute. When does this occur?

Problem 5

If V is the volume of a cube with edge length x and the cube expands as time passes, find $V'(T)$ in terms of $x'(t)$.