Problem 1

Show that the equation $\cos(x) = x$ has a solution by using the Intermediate Value Theorem.

Problem 2

Determine all x-values where

$$f(x) = \begin{cases} x & x \leq 1 \\ x^2 + 2 & 1 < x \leq 2 \\ 6 & 2 < x < 3 \\ 2x & 3 < x \end{cases}$$

is not continuous. Give reasons for your answers.

Problem 3

Let $f(x) = 3x^2 + 1$. Using the limit definition of the slope of the tangent line, find the slope of $f(x)$ at $x = 1$. Then, give the equation of the tangent line of $f(x)$ at $x = 1$.

Problem 4

Let $f(x) = \dfrac{1}{x+2}$. Using the limit definition of the slope of the tangent line, find the slope of $f(x)$ at $x = 2$.