Unit name

Assessment name

Due on 1 January, 20yy at 11:59pm

Unit coordinator name

Semester s, yyyy

Student name

Student number

October 12, 2024

Question 1

Given

$$f(x) = \begin{cases} x^3 & 0 \leqslant x < 2 \\ -x & 2 \leqslant x < 4 \\ 0 & \text{otherwise.} \end{cases} \tag{1}$$

(a) Find the slope of $f(x)$ at $x = 1$.

Solution.
The first derivative of $f(x)$ is given by

$$f'(x) = \begin{cases} 0 & x \leqslant 0 \\ 3x^2 & 0 < x < 2 \\ -1 & 2 < x < 4 \\ 0 & x > 4 \\ \text{indeterminate} & \text{otherwise.} \end{cases}$$

At $x = 1$, the slope of the function $f(x)$ is $3(1)^2 = 3$.