5. The function f is defined by

$$f(x) = \begin{cases} 3x^2 + 2x & \text{for } x \leq 0 \\ e^{2x} + 2 & \text{for } x > 0. \end{cases}$$

(a) Is f continuous at $x = 0$? Justify your answer.

(b) Find $f'(-2)$ and $f'(3)$.

(c) Explain why $f'(0)$ does not exist.

(d) Let g be the function given by $g(x) = \int_{-1}^{x} f(t)\, dt$. Find $g(1)$. **2nd Semester**