Hand your completed quiz in before the due date. Do not forget to write down your name and student ID number. Marks will be awarded for this quiz based on the clarity of your answers. The marker will pay close attention to the logic of your answers. Please show all your working.

Q1. Differentiate the function.
   (a) \( f(x) = (x^3 + 2x)e^x \).
   (b) \( f(x) = e^{ax^3} \).
   (c) \( f(x) = e^x \).

Q2. Find \( y' \) if \( e^{x/y} = x - y \).

Q3. For what values of \( \lambda \) does the function \( y = e^{\lambda x} \) satisfy the differential equation \( y'' + 6y' + 8y = 0 \)?

Q4. If \( f(x) = e^{2x} \), find a formula for \( f^{(n)}(x) \).

Q5. Evaluate the integral.
   (a) \( \int_0^2 \frac{dx}{e^x} \).
   (b) \( \int e^x \sqrt{1 + e^x} \, dx \).

Q6. Differentiate the function.
   (a) \( f(x) = x^5 + 5^x \).
   (b) \( f(x) = 10^{\sqrt{x}} \).
   (c) \( f(x) = x^x \).

Q7. Evaluate the integral.
   (a) \( \int_1^2 10^t \, dt \).
   (b) \( \int 3^\sin\theta \cos\theta \, d\theta \).

Q8. Find \( y' \) if \( xy = y^x \).

Q9. Calculate \( \lim_{x \to \infty} x^{-\ln x} \).