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. Find \( \frac{dy}{dx} \) by implicit differentiation.

(a) \( x^3 + y^3 = 1 \).

(b) \( y \cos x = x^2 + y^2 \).

(c) \( y \sin(x^2) = x \sin(y^2) \).

(d) \( \sqrt{x + y} = 1 + x^2 y^2 \).

Q2. If \( f(x) + x^2[f(x)]^3 = 10 \) and \( f(1) = 2 \), find \( f'(1) \).

Q3. If \( g(x) + x \sin g(x) = x^2 \), find \( g'(0) \).

Q4. Find \( y'' \) by implicit differentiation.

(a) \( 9x^2 + y^2 = 9 \).

(b) \( \sqrt{x} + \sqrt{y} = 1 \).

Q5. Show that the sum of the \( x \)- and \( y \)-intercepts of any tangent line to the curve \( \sqrt{x} + \sqrt{y} = \sqrt{c} \) is equal to \( c \).

Q6. Find the linearisation \( L \) of the function at \( x = a \).

(a) \( f(x) = x^4 + 3x^2, \ a = -1 \).

(b) \( f(x) = \sqrt{x}, \ a = 4 \).

Q7. Use the linear approximation to estimate the given number.

(a) \( (1.999)^4 \).

(b) \( \frac{1}{4.002} \).

Q8. Find the differential of each function.

(a) \( y = \frac{1-u^2}{1+u^2} \).

(b) \( y = u \cos u \).

(c) \( y = \frac{s}{1+2s} \).