Certificate in AI 2.0

Calculus - Quiz 2

January 27, 2025

Time allowed: 45 minutes
Total marks: 30

Question 1. A delivery drone operates in a coordinate system where each unit represents 1 kilometer. The drone starts at the origin O(0,0) and needs to deliver packages to two locations: A(3,4) and B(7,0).

(a) Plot these three points (O, A, and B) on a coordinate plane. Calculate the exact distance from O to A, and from A to B. [4]

(b) The drone's safe flying zone is a circle centered at O with radius 8 kilometers. Write the equation of this circle and determine whether points A and B lie within the safe zone. [4]

(c) Write the equation of line AB in slope-intercept form. Then find the coordinates of point P where this line intersects the y-axis. [4]

(d) If the drone must maintain a minimum height of $y = 2$ units while traveling, determine whether the straight path from A to B satisfies this requirement. [3]

Question 2. A computer security camera has a rectangular detection zone with corners at points P(0,0), Q(6,0), R(6,4), and S(0,4).

(a) Plot this rectangular region and find its area. [3]

(b) Calculate the length of the diagonal PR using the distance formula. [3]

(c) A suspicious activity is detected at point X(2,3). Find the distance from X to each corner of the rectangle and determine which corner is closest to X. [4]

(d) Write the equations of all four sides of the rectangle. [5]

Question 3. An AI system's accuracy can be modeled using different functions:

$$f(x) = x^2 - 2x + 3$$

$$g(x) = 5 - \frac{x}{2}$$

where x represents the amount of training data (in thousands).

(a) Plot both functions f(x) and g(x) for $x \in [0, 4]$ on the same coordinate system. [4]

(b) Find the x-coordinates where f(x) = g(x). [4]

(c) For what values of x is $f(x) > g(x)$? Explain your answer using your graph. [3]

(d) Find f(1), f(2), and g(2). Which function gives better accuracy when x = 2? [4]