KUWAIT UNIVERSITY CALCULUS II—MATH 102 December 2, 1999
MATH & COMP. SCI. DEP'T SECOND MIDTERM TEST Time: 75 minutes

NSTRUCTIONS: Attempt all problems. Calculators and/or mo-ile phones are not allowed. Each (sub)question is worth the points ndicated on the left.

1. (7 points each) Evaluate each of the following integrals.

(a) $\int \tan^2 x \cos^5 x \, dx$

(b) $\int \sin(\ln x) \, dx$

(c) $\int \frac{dx}{x^2\sqrt{x^2+1}}$

(d) $\int \frac{3x^2-4x+5}{(x-1)(x^2+1)} \, dx$

2. (7 points) Determine whether the improper integral converges or diverges. If it converges, find its value.

$$\int_0^\infty xe^{-x} \, dx$$

3. (7 points) Consider the curve

$$x = \frac{2}{9}t^{9/2}, \quad y = \frac{1}{3}t^3, \quad 0 \le t \le 2$$

(a) Find the slope of the tangent line to the curve at the point corresponding to $t = 1/4$.

(b) Find the length of the curve.

4. (8 points) Find the area of the region inside both of the curves:

$$r = 1 + \sin\theta, \quad \text{and} \quad r = 3\sin\theta.$$