Kuwait University

Dept. of Mathematics

Math. 101 (First Test)

Time: 75 minutes — November 9, 1989

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1. (a) Solve the inequality $\frac{1}{x} - \frac{1}{x^2} \leq 3$.

(b) Sketch and name the graph of the following equation

$$x^2+3y^2-4x-5 = 0 .$$

(10 points)

2. Find an equation of the circle in the first quadrant that is tangent to both the x and y axes with centre on the line $y+5x-12 = 0$.

(10 points)

3 Suppose that.

$$f(x) = \begin{cases} 4x , & x < -1 \\ ax+b, & -1 \leq x \leq 2 \\ -5x , & x > 2 \end{cases}$$

Find the values of a and b such that f(x) is continuous at -1 and at 2.

(10 points)

4. (a) Using the definition of the limit, show that:

$$\lim_{x \to -1} 2x+5 = 3$$

(b) Evaluate the following limit (if exists)

$$\lim_{x \to -1} \frac{[x-2] + [x]}{x} .$$

(15 points)

5. Let $f(x) = x^2+3x+4$.

(a) Using the definition of the derivative, find $f'(1)$.

(b) Find an equation for the tangent line to the graph of f at $x = 1$.

(15 points)