AMAT 309 L02 Winter 2003
Quiz 4 30 Minutes

NAME: _____ **ID**: _____

1. Determine whether the matrix A is positive definite, negative definite, indefinite, or none of these: [30]

$$A = \begin{bmatrix} -2 & 1 & 5 \\ 1 & -3 & 0 \\ 5 & 0 & -16 \end{bmatrix} .$$

2. Let [30]

$$f(x) = \int_0^1 \frac{t^x}{\ln t}\, dt, \quad x > -1 .$$

(a) Find $f'(x)$.

(b) Using (a) show that $f(x) = \ln(x+1) + C$, for some constant C.

3. Determine the absolute maximum and absolute minimum of the function $f(x,y) = x^2 + y^2 - 4x - 2y - 3$ in the closed, bounded domain $4x^2 + 9y^2 \leq 36$. See the hint at the bottom of page for help with the algebra and numerical work. [40]

Hint: At some point you should derive the equations $x = 2/(1 + 4\lambda)$, $y = 1/(1 + 9\lambda)$, $16/(1 + 4\lambda)^2 + 9/(1 + 9\lambda)^2 = 36$. There are two solutions: $\lambda = -.02733$, $x = 2.2455$, $y = 1.3262$, and $\lambda = -.41944$, $x = -2.9509$, $y = -.36037$. Furthermore, $f(2.2455, 1.3262) = -7.8333$, $f(-2.9509, -.36037) = 18.3620$.