MA 241 - Exam 2 July 17, 2003
(Total = 100 points)
Show all work!!

1. (5 pts.) $\sin(\tan^{-1} x) =$ (pick one):

   a) $\dfrac{\sin^2 x}{\cos x}$ b) $\sin x$ c) $\dfrac{1}{\sqrt{1+x^2}}$ d) $\dfrac{x}{\sqrt{1+x^2}}$ e) $\sin^{-1} x$.

2. (5 pts.) $\tan(x+y) =$(pick one):

   a) $\tan x + \tan y$ b) $\dfrac{\sin x + \sin y}{\cos x + \cos y}$ c) $\dfrac{\tan x + \tan y}{1 - \tan x \tan y}$

   d) $\dfrac{\tan x - \tan y}{1 + \tan x \tan y}$ e) $\dfrac{\sin x \cos y + \sin y \cos x}{\cos x \cos y}$.

2. (10 pts.) The left, right, Trapezoidal, and Midpoint Rule approximations were used to estimate $\int_0^3 f(x)\,dx$ where, on the interval $[0,3]$, f is increasing and concave down. The estimates were 3.1546, 3.1348, 3.1743, and 3.1592, and the same number of subdivisions were used in each case. Which rule produced which estimate?

4. Use the Table of Integrals to evaluate each integral (15 pts. each):

   a) $\displaystyle\int \sqrt{5 - 4x - x^2}\,dx$ b) $\displaystyle\int \frac{\ln(\sin^{-1}(x))}{\sqrt{1-x^2}}\,dx.$

5. Determine whether each of the following improper integrals is convergent or divergent. Evaluate those that are convergent (15 pts. each):

   a) $\displaystyle\int_1^2 (x-1)^{-3/2}\,dx$ b) $\displaystyle\int_2^\infty \frac{1}{x(\ln x)^2}\,dx.$

6. (20 pts.) Find the volumes of the solids obtained by rotating the region bounded by $y = x - x^2$ and the x-axis: a) about the x-axis, and b) about the y-axis.