Math 132, Exam 1 Fall 2002

- No papers or notes may be used, but you can use your calculator.
- Please don’t just give an answer. Clearly explain how you get it.
- This is a 2 hour exam.

1a) [10 points] Find the general indefinite integral:

\[ \int \frac{\ln(x)}{x} \, dx \]

1b) [10 points] Evaluate the integral:

\[ \int_{1}^{3} \sqrt{x(x^{3/2} - \frac{3}{x})} \, dx \]

2) [10 points] An animal population is increasing at a rate given by the function \( f(t) = 10e^{2t} \) animals/year. What is the total change in animal population between the fifth \( (t = 5) \) and the seventh \( (t = 7) \) year ?

3) [10 points] If

\[ F(x) = \int_{0}^{\sin x} t e^t \, dt, \]

a) find \( F'(x) \)

b) find \( F(\pi) \).

4) [10 points] Estimate the area under the graph of \( f(x) = x^2 + 2 \), between 0 and 4, a) Using 4 rectangles and left endpoints. Plot the relevant graph showing the rectangles. b) Is your estimate in a) an underestimate or an overestimate ?

c) Find the actual area.

5) [10 points] The velocity of a particle is given by \( v(t) = 6 - 3t \) m/sec. What is the total displacement of the particle between \( t = 0 \) sec and \( t = 3 \) sec ? What is the total distance it has traveled between these times ?

6) [10 points] A particle (that can move along the x-axis) at \( t = 0 \) sec is at \( x = 0 \) m, with speed \( v = 0 \) m/sec. From that moment onwards the particle has a constant acceleration \( a = 5 \) m/sec^2. At what distance \( x \) (in meters) will the particle have a speed of \( v = 10 \) m/sec ?

7) [10 points] Sketch the region enclosed by the curves \( y = |x| \) and \( y = x^2 - 2 \) and evaluate its area.

8) [10 points] Find the volume of the solid obtained by rotating the region bounded by \( y = \frac{1}{\sqrt{x}} \) and \( y = x \), between \( x = 1 \) and \( x = 2 \) around the x-axis.