MATH 122
TEST I Name _____

1.(20) Find antiderivatives. No credit without showing your work.

a) $\displaystyle\int \frac{\arctan x}{1+x^2}dx$

b) $\displaystyle\int \frac{3x}{e^{2x}}dx$

2.(10) $\displaystyle\int x^2\, e^{3x}\, dx = x^3 e^{3x} + \int x^3\, e^{3x}\, dx.$ Comment on this use of integration by parts. Is the rule applied correctly? (If not, correct it.) Is it useful? How has it helped/hurt? Where do we go next? (There should be mostly words here and very little computation.)

3.(10) Data is gathered on the rate (meters per second) at which an object is moving. The data is

t (sec)	0	2	4	6
w (m/s)	1	4	6	7

a) Approximate the total distance travelled for $0 \le t \le 6$.

b) Do you think this approximation is high or low? Why? (Picture??)

4.(20) Compute the following two integrals. Find one exactly (show your work). Approximate the other. For the one you are approximating, give the answer to 3 place accuracy; tell how you got it and how you know it has the desired degree of accuracy. (You do not need to use the "error form" for this problem. Think about methods that will overestimate and underestimate.)

a) $\displaystyle\int_2^3 \frac{1}{\ln x}\, dx$

b) $\displaystyle\int_2^5 \frac{x\, dx}{(x-1)(x+2)}$

5.(20) Evaluate one integral (i.e., find a number). For the other, tell only if it converges or diverges. Justify your answers.

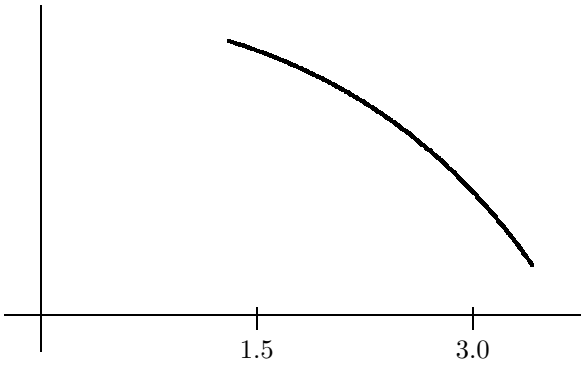
a) $\displaystyle\int_0^2 \frac{4}{x-2}^{1/3} dx$

b) $\displaystyle\int_0^\infty \frac{\sin^2 x}{x^2+1}dx$

6.(20) Consider the integral $\displaystyle\int_{1.5}^3 (1+\cos(\frac{x^2}{5}))dx.$

a) Use EITHER the trapezoidal rule OR the midpoint rule with $n = 3$ and write out in full (but do NO arithmetic!!) the approximate value of the integral.

b) On the figure, illustrate your solution from (a).



c) Use your TI-92 and a program to approximate the value of the integral using Simpson's rule with $n = 8$.

d) Use your knowledge of the form of the error in Simpson's rule to find an upper bound for the error in your answer to (c).