DO NOT TURN OVER UNTIL INSTRUCTED TO DO SO.

Formulae

$$\int \tan(x)\ dx = \ln|\sec(x)| + C \qquad \int \sec(x)\ dx = \ln|\sec(x) + \tan(x)| + C$$

$$\int \frac{1}{1+x^2} dx = \arctan(x) + C \qquad \int \frac{1}{\sqrt{1-x^2}} dx = \arcsin(x) + C$$

$$\frac{d\tan(x)}{dx} = \sec^2(x) \qquad \frac{d\sec(x)}{dx} = \tan(x)\sec(x)$$

$$1 = \sin^2(x) + \cos^2(x) \qquad 1 + \tan^2(x) = \sec^2(x)$$

$$\cos^2(x) = \frac{1+\cos(2x)}{2} \qquad \sin^2(x) = \frac{1-\cos(2x)}{2}$$

$$|E_T| \leq \frac{K(b-a)^3}{12n^2} \qquad |E_S| \leq \frac{K(b-a)^5}{180n^4}$$

CALCULATORS ARE NOT PERMITTED

This exam consists of 5 questions. Answer the questions in the spaces provided.

Name and section: ____________________

GSI's name: ____________________

1. Compute the following integrals:

   (a) (10 points)

$$\int \ln(x)^2 \, dx$$

   Solution:

   (b) (10 points)

$$\int \tan^5(x) \sec^{-3}(x) \, dx$$

   Solution:

2. (20 points) Find the arc length of the the curve $y = \ln(\cos(x))$ between 0 and $\frac{\pi}{3}$.

   Solution:

3. (20 points) Compute the following integral:

$$\int \frac{x^3 + x^2 - x + 1}{(x-1)^2(x^2+1)}\, dx$$

Solution:

4. (a) (10 points) Use the Trapizoidal Rule with n=4 to approximate the definite integral

$$\int_0^8 f(x)\, dx,$$

where $f(x)$ takes the following values:

x	0	1	2	3	4	5	6	7	8
$f(x)$	0	2	4	3	1	4	5	5	3

Solution:

(b) (10 points) Assuming that $|f''(x)| \leq 2$, for all $0 < x < 8$, how large an n would we need to choose to guarantee that

$$|E_T| \leq 0.01$$

Solution:

5. (20 points) Evaluate following improper integral:

$$\int_{-1}^{0} \frac{(x+1)^5}{\sqrt{(-x^2-2x)}}\, dx$$

If it is divergent, write divergent and explain your reasoning.

Solution:

END OF EXAM