## DO NOT TURN OVER UNTIL INSTRUCTED TO DO SO.

## Formulae

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

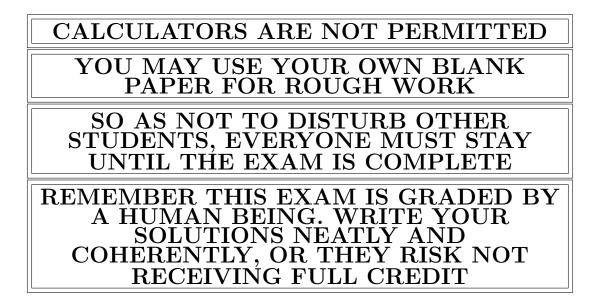
$$\int \frac{1}{1+x^2} dx = \arctan(x) + C \qquad \int \frac{1}{\sqrt{1-x^2}} dx = \arcsin(x) + C$$

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

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

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

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



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

- 1. Compute the following integrals:
  - (a) (10 points)

 $\int x^{-2} \ln(x) \ dx$ 

Solution:

(b) (10 points)

$$\int \frac{1}{\sqrt{x^2 + 4x + 5}} dx$$

Solution:

2. (20 points) Compute the following integral:

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

Solution:

3. (20 points) Find the area of the surface of revolution (about the x-axis) of the curve  $y = (x - 1)^3$  between x = 1 and x = 2. Solution:

- 4. Evaluate following improper integrals (if divergent, write divergent and explain your reasoning):
  - (a) (10 points)

$$\int_{-\infty}^{\infty} e^{|x|} dx$$

Solution:

(b) (10 points)

$$\int_0^2 \frac{4 + \cos(x)}{x^5} dx$$

(Hint: use the comparison test) Solution:

5. (a) (10 points) Assume that f(0) = 3. Use Simpsons Rule with n = 6 to approximate the value of f(6), where f'(x) takes the following values:

x	0	1	2	3	4	5	6
f'(x)	0	2	4	3	1	4	5

Solution:

(b) (10 points) Assuming that  $|f^{(5)}(x)| \leq 1$ , for all 0 < x < 6, how large an *n* would you need to choose to guarantee that the above estimate is within 0.001 of the true value of f(6)? You do not need to give an exact answer, just a rough bound. **Solution:**