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Your exam ID #

1. **PLEASE DO NOT TURN THIS PAGE UNTIL TOLD TO DO SO.**
2. No notes, books, or classmates may be used as resources for this exam. It is a violation of the University honor code to, in any way, assist another person in the completion of this exam. Please keep your own work covered up as much as possible during the exam so that others will not be tempted or distracted. Thank you for your cooperation.
3. Read directions to each problem carefully. Show all work for full credit. In most cases, a correct answer with no supporting work will not receive full credit. The best way to get maximum partial credit is to write neatly and be organized.
4. Make sure that you have seven (7) pages, including the cover page.
5. Include units on answers where units are appropriate.
6. YOU WILL BE GRADED ON PROPER USE OF integral ( $\int$ ),  $dx$ ,  $du$ , and  $dv$  notation.
7. You have until 8:50 a.m. to complete the exam.

1.) (6 pts. each) Integrate.

a.)  $\int (x+1) e^{x^2+2x-5} dx$

b.)  $\int_0^1 x(1-x)^{20} dx$

c.)  $\int \sec^{10} x \tan x dx$

d.)  $\int \frac{x^3+10}{x+3} dx$

e.)  $\int \ln x dx$

$$f.) \int_0^4 |6 - 2x| \, dx$$

$$g.) \int (1 + \sin 3x)^2 \, dx$$

$$h.) \int x \cdot \cos x \, dx$$

$$i.) \int e^{2x} \sqrt{3 + e^x} \, dx$$

2.) (4 pts.) Estimate the value of the following definite integral by computing  $M_3$ , the Midpoint Rule estimate with  $n = 3$ . Write your answer as a decimal to three decimal places.

$$\int_0^6 \sqrt{4+x^2} \, dx$$

3.) (6 pts.) Find the area of the region bounded by the graphs of  $\uparrow$  and  $\uparrow$ . SET UP BUT DO NOT EVALUATE THE INTEGRAL(S).  
 $x = 3y^2$        $x = 4 - y^2$

4.) (8 pts.) Find the area of the region bounded by the graphs of  $y = \sin x$  and  $y = \sin 2x$  on the interval  $[0, 2\pi]$ . SET UP BUT DO NOT EVALUATE THE INTEGRAL(S).

5.) (6 pts.) The velocity of a car at time  $t$  hours is given by  $v(t) = 50 t e^{-t^2}$  mph. How far does the car travel between  $t = 0$  hrs. and  $t = 2$  hrs. ? Write your answer as a decimal to one decimal place.

6.) The outdoor temperature ( $^{\circ}\text{F}$ ) at time  $t$  hours is given by  $T = 40 + \frac{50}{(t+1)^2}$  .

a.) (2 pts.) What is the initial temperature ? What is the temperature after  $t = 4$  hours ?

b.) (2 pts.) At what rate is the temperature changing when  $t = 4$  hrs. ?

c.) (4 pts.) What is the average temperature between  $t = 0$  and  $t = 4$  hours ?

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7.) (7 pts. each) Consider the region bounded by the graphs of  $y = e^x$ ,  $x = \ln 5$ ,  $y = 0$ , and  $x = 0$ . SET UP BUT DO NOT EVALUATE THE INTEGRAL(S) which represent the volume of the solid formed by revolving this region

a.) about the x-axis.

b.) about the y-axis.

EXTRA CREDIT PROBLEMS-- Each of the following problems is worth 8 extra credit points.  
These problems are optional.

1.) Integrate  $\int \sqrt{1+x} \, dx$

2.) Assume that  $y = f(x)$  is an odd function and that  $\int_1^3 f(x) \, dx = 7$  and  $\int_{-1}^2 f(x) \, dx = 4$ .  
Find the value of  $\int_2^3 f(x) \, dx$ .