

MATH 142

MIDTERM EXAM II

November 4, 2003

NAME (please print legibly): _____

Your University ID Number: _____

Circle your Instructor's Name along with the Lecture Time:

Knightly (9 AM) Cranston (3:25 PM)

- No calculators are allowed on this exam.
- Please show all your work. You may use back pages if necessary. You may not receive full credit for a correct answer if there is no work shown.

QUESTION	VALUE	SCORE
1	15	
2	24	
3	18	
4	15	
5	14	
6	14	
TOTAL	100	

1. (15 pts)

(a) Find the derivative of $F(x) = \int_0^x \sin^3(t) dt$

ANSWER: _____

(b) Find the derivative of $G(x) = \int_x^{2x} \sqrt{t} dt$

ANSWER: _____

(c) Find an antiderivative of $f(x) = |x|$.

ANSWER: _____

2. (24 pts) Compute the following.

(a) Find the average value of $f(x) = \sin x$ on $[0, \pi]$.

ANSWER: _____

(b) $\int_1^3 \frac{t+1}{t} dt$

ANSWER: _____

(c) $\int 2xe^{x^2+2} dx$

ANSWER: _____

(d) $\int_0^1 (2x+3)^{19} dx$

ANSWER: _____

3. (18 pts) Consider the region bounded by $y = \frac{1}{x}$, the x -axis, and the vertical lines $x = 1$ and $x = 3$.

(a) Find the volume of the solid obtained by rotating the region about the x -axis.

ANSWER: _____

(b) Find the volume of the solid obtained by rotating the region about the y -axis.

ANSWER: _____

4. (15 pts) A box-shaped well has a square base with dimensions 10 feet by 10 feet. The well is 30 feet deep and contains water to a depth of 20 feet. How much work is required to pump the water out of the well? Use the fact that 1 cubic foot of water weighs 62.5 lbs.

5. (14 pts) Find the area between the curves $y = x^2$ and $y = 8 - x^2$.

ANSWER: _____

6. (14 pts) The velocity of a bug crawling on the y -axis at time t is

$$v(t) = t^2 - 1.$$

(a) Find the displacement of the bug from $t = 0$ to $t = 10$.

ANSWER: _____

(b) Find the total distance crawled by the bug from $t = 0$ to $t = 10$.

ANSWER: _____