MATH 142

MIDTERM EXAM II

April 3, 2003

NAME (please print legibly): _____

Your University ID Number: _____

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

Caulk (9 o'clock) Knightly (10 o'clock) Moustafaev (2 o'clock) Qiu (2 o'clock)

- **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	12	
2	12	
3	16	
4	10	
5	10	
6	12	
7	8	
8	8	
9	12	
TOTAL	100	

1. (12 pts) Find $F'(x)$ for F as given:

(a) $F(x) = \displaystyle\int_{-2}^{x} \sqrt{t^2 - 2t + 5}\, dt$

ANSWER: _____

(b) $F(x) = \displaystyle\int_{0}^{x^3} \sec t\, dt$

ANSWER: _____

2. (12 pts) Evaluate the following integrals.

(a) $\int 1\,dx$

ANSWER: _____

(b) $\int_{-\pi/2}^{\pi/2} \sin^7 x\,dx$

ANSWER: _____

(c) $\int \tan x\,dx$

ANSWER: _____

3. (16 pts) Find the area of the region(s) bounded by the given functions:

(a) $f(x) = x^2 - 4x + 3$
$g(x) = -x^2 + 2x + 3.$

ANSWER: _____

(b) $y = x^3 - 2x$
$y = 2x.$

ANSWER: _____

4. (10 pts) Find the volume of the solid obtained by rotating the region bounded by the curve $y = x^2$ and the line $y = x$ around the horizontal line $y = -1$.

ANSWER: _____

5. (10 pts) Find the volume of the solid obtained by rotating the region bounded by the following four lines:

$$\text{the } x\text{-axis}, \quad y = x, \quad y = x - 2, \quad \text{and the horizontal line } y = 1,$$

around the x-axis.

ANSWER: _____

6. (12 pts) A cylindrical well is 12 feet deep with a radius of 3 feet. The well contains 9 feet of water, measured from the bottom. How much work is required to pump all of the water up to ground level?

(Recall that water weighs 62.5 lbs/ft^3.)

ANSWER: _____

7. (8 pts) The wavelength of light emitted by supernova at time t is

$$w(t) = \frac{t^2 + 1}{t^2} \text{ nanometers.}$$

Find the average wavelength between $t = 1/2$ and $t = 2$.

ANSWER: _____

8. (8 pts) Evaluate the following integrals.

(a) $\displaystyle\int_0^1 x\sqrt{1-x^2}\,dx$

ANSWER: _____

(b) $\displaystyle\int t\sqrt{t-4}\,dt$

ANSWER: _____

9. (12 pts) Evaluate the following integrals.

(a) $\int xe^{-2x}\,dx$

ANSWER: _____

(b) $\int \ln x\,dx$

ANSWER: _____