MATH 152, SPRING SEMESTER 2005
COMMON EXAMINATION I - VERSION A

Name (print): _____

Signature: _____

Instructor's name: _____

Section No: _____

Seat No: _____

INSTRUCTIONS

1. Calculators may <u>not</u> be used on this exam. The ScanTrons will be collected after 90 minutes.

2. In Part 1 (Problems 1–10), mark the correct choice on your ScanTron form using a No.2 pencil. *For your own record, mark your choices on the exam itself*, as the ScanTrons will <u>not</u> be returned.

3. In Part 2 (Problems 11–15), present your solutions in the space provided. **Show all your work** neatly and concisely, and **indicate your final answer clearly**. You will be graded, not merely on the final answer, but also on the quality and correctness of the work leading up to it.

4. Be sure to **write your name, section number, and version letter of the exam on the ScanTron form**.

<u>QN</u>	<u>PTS</u>
1–10	
11	
12	
13	
14	
15	
TOTAL	

Part 1 – Multiple Choice (50 points)

*Read each question carefully; each problem is worth **5 points**.*

1. Find the average value of $f(x) = x\sin(x^2)$ over the interval $[0, \sqrt{\pi}]$.

   (a) $\dfrac{1}{2\sqrt{\pi}}$

   (b) $\dfrac{1}{\sqrt{\pi}}$

   (c) 1

   (d) 2

   (e) 0

2. The force required to maintain a spring stretched 2 inches beyond its natural length is 3 pounds. How much work is done in stretching the spring from its natural length to 2 feet beyond its natural length? Note: 1 foot=12 inches.

   (a) 3 foot-pounds

   (b) 18 foot-pounds

   (c) 12 foot-pounds

   (d) 36 foot-pounds

   (e) 42 foot-pounds

3. Find the area of the region bounded by $y = |x^2 - 1|$, $y = 0$, $x = 0$ and $x = 2$.

   (a) 2

   (b) 1

   (c) $\dfrac{2}{3}$

   (d) $\dfrac{3}{2}$

   (e) $\dfrac{1}{2}$

4. Evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \sin^2 x \cos^2 x\, dx$.

(a) $\dfrac{\pi}{4}$

(b) $\dfrac{\pi}{8}$

(c) $\dfrac{\pi}{2}$

(d) π

(e) $\dfrac{\pi}{16}$

5. The region bounded by $y = e^x$, $y = 0$, $x = 0$, and $x = 3$ is revolved around the x-axis. Find the volume of the resulting solid.

(a) $2\pi(e^6 - 1)$

(b) $\pi(e^6 - 1)$

(c) $\dfrac{\pi}{2}(e^6 - 1)$

(d) $\dfrac{\pi}{2}(e^3 - 1)$

(e) $\dfrac{\pi}{6}(e^9 - 1)$

6. Evaluate $\displaystyle\int_1^3 x \ln x\, dx$.

(a) $\dfrac{9}{2}\ln 3 - 2$

(b) $3\ln 3 - 2$

(c) $\dfrac{9}{2}\ln 3$

(d) $\ln 3$

(e) $\ln 3 - \dfrac{1}{2}$

7. $\displaystyle\int \sin^3 x \cos^2 x\, dx =$

(a) $\dfrac{\cos^3 x}{3} - \dfrac{\cos^5 x}{5} + C$

(b) $\dfrac{\cos^5 x}{5} - \dfrac{\cos^3 x}{3} + C$

(c) $\dfrac{\sin^4 x \cos^3 x}{12} + C$

(d) $-\cos^3 x \sin^2 x + C$

(e) $\dfrac{\sin^4 x}{4} - \dfrac{\sin^6 x}{6} + C$

8. $\displaystyle\int_1^2 \dfrac{x}{x+1}\, dx =$

(a) $1 + \ln 2$

(b) $1 + \ln 6$

(c) $\dfrac{1}{6}$

(d) $1 - \ln\dfrac{2}{3}$

(e) $1 + \ln\dfrac{2}{3}$

9. The region bounded by $y = x^2$ and $y = 2x$ is rotated about the x-axis. Find the volume of the resulting solid.

(a) $\dfrac{4}{3}$

(b) $\dfrac{8\pi}{15}$

(c) $\dfrac{4\pi}{3}$

(d) $\dfrac{64\pi}{15}$

(e) $\dfrac{16\pi}{15}$

10. Suppose it is given that $f(5) = 3$, $f'(5) = 2$, $f(1) = 4$ and $f'(1) = -1$. Compute $\int_1^5 x f''(x)\, dx$.

Hint: Use integration by parts.

(a) $\dfrac{75}{2}$

(b) 11

(c) 12

(d) 9

(e) Not enough information to determine.

The use of a calculator is NOT permitted for this part of the exam. All work must be shown in order to receive credit. Refer to the front page for further instructions.

11. (10 points) A tank is full of water. Find the work required to pump all of the water to the top of the tank. Note: The weight density of water is $\delta = \rho g = 9800$ Newtons per cubic meter.

1 m

3 m

semicircle
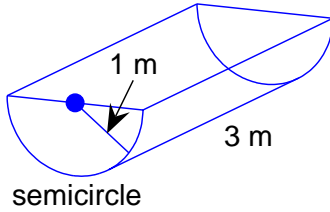
12. (10 points) Find the volume of the solid S described below:

The base of S is the ellipse $x^2 + \dfrac{y^2}{4} = 1$. Cross-sections perpendicular to the y-axis are squares.

13. (`12 points`) Consider the area of the region bounded by $y = \sqrt{x}$, $y = 2 - x$ and $y = 0$.

    a.) Sketch the bounded region.
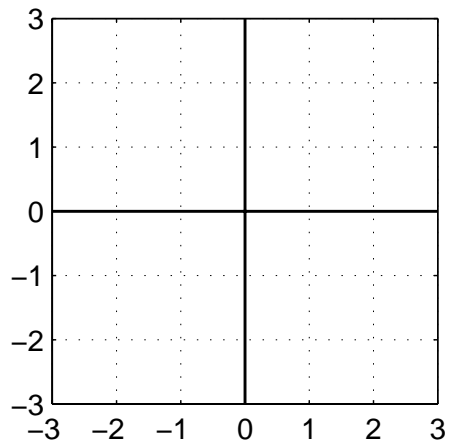
    b.) Find the volume obtained by revolving the region about the x-axis.

14. (12 points) Evaluate $\displaystyle\int \frac{dx}{x^2\sqrt{25-x^2}}$.

15. (12 points) Evaluate $\displaystyle\int \frac{10}{(x-1)(x^2+9)}\, dx.$