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

Name (print): _____

Signature: _____

Instructor's name: _____

Section No: _____

Seat No: _____

INSTRUCTIONS

1. Calculators may *not* 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 *not* 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**.

QN	PTS
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. Evaluate $\int_1^3 x \ln x \, dx$.

(a) $3 \ln 3 - 2$

(b) $\frac{9}{2} \ln 3$

(c) $\ln 3 - \frac{1}{2}$

(d) $\frac{9}{2} \ln 3 - 2$

(e) $\ln 3$

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

(b) $\frac{\pi}{2}(e^6 - 1)$

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

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

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

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

(a) $\frac{8\pi}{15}$

(b) $\frac{4\pi}{3}$

(c) $\frac{16\pi}{15}$

(d) $\frac{4}{3}$

(e) $\frac{64\pi}{15}$

4. $\displaystyle\int_1^2 \frac{x}{x+1}\,dx =$

(a) $1 + \ln 6$

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

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

(d) $1 + \ln 2$

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

5. 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) 18 foot-pounds

(b) 12 foot-pounds

(c) 42 foot-pounds

(d) 3 foot-pounds

(e) 36 foot-pounds

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

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

(b) $\dfrac{2}{\sqrt{\pi}}$

(c) 2

(d) 0

(e) 1

7. Suppose it is given that $f(5) = 3$, $f'(5) = 2$, $f(1) = 4$ and $f'(1) = -1$. Compute $\int_1^5 xf''(x)\,dx$. Hint: Use integration by parts.

(a) 11

(b) $\frac{75}{2}$

(c) 9

(d) 12

(e) Not enough information to determine.

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

(a) $\frac{\pi}{8}$

(b) $\frac{\pi}{2}$

(c) $\frac{\pi}{16}$

(d) π

(e) $\frac{\pi}{4}$

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

(a) 1

(b) 2

(c) $\frac{1}{2}$

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

(e) $\frac{3}{2}$

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

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

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

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

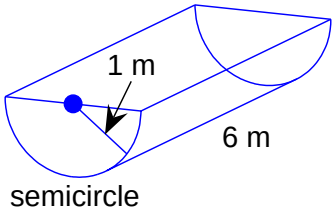
(d) $\dfrac{\sin^4 x \cos^3 x}{12} + C$

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

Part 2 (56 points)

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.

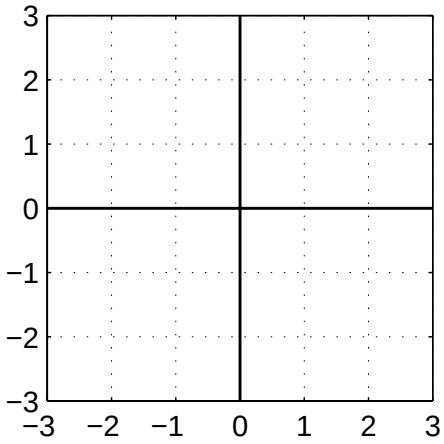


12. (10 points) Find the volume of the solid S described below:

The base of S is the ellipse $x^2 + \dfrac{y^2}{9} = 1$. 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 $\displaystyle\int \frac{dx}{x^2\sqrt{16-x^2}}$.

15. (12 points) Evaluate $\displaystyle\int \frac{5}{(x-1)(x^2+4)}\,dx$.