MATH 152, FALL SEMESTER 2009
COMMON EXAMINATION I - VERSION A

Name (print):_____

Signature: _____

Instructor's name: _____

Section No: _____

INSTRUCTIONS

1. In Part 1 (Problems 1–10), mark your responses on your ScanTron form using a No: 2 pencil. *For your own record, mark your choices on the exam as well.*

2. Calculators **should not be used** throughout the examination.

3. In Part 2 (Problems 11–16), 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**.

Part 1 – Multiple Choice (50 points)

Each question is worth **5 points**. *Mark your responses on the ScanTron form and on the exam itself.*

1. Compute the indefinite integral $\int x^3 \sqrt{2+x^4}\, dx$.

(a) $\dfrac{2(2+x^4)^{3/2}}{3} + C$

(b) $\dfrac{(2+x^4)^{3/2}}{4} + C$

(c) $\dfrac{(2+x^4)^{3/2}}{6} + C$

(d) $\dfrac{(2+x^4)^{-1/2}}{8} + C$

(e) $\dfrac{(2+x^4)^{-1/2}}{2} + C$

2. Compute the indefinite integral $\int e^x (1+e^x)^{10}\, dx$.

(a) $e^x \dfrac{(1+e^x)^{11}}{11} + C$

(b) $(1+e^x)^{11} + C$

(c) $10(1+e^x)^9 + C$

(d) $\dfrac{(1+e^x)^{11}}{11} + C$

(e) $e^x + e^{10x} + C$

3. Evaluate the definite integral $\displaystyle\int_0^{\pi/4} \frac{\sec^2\theta}{2+\tan\theta}\,d\theta$.

(a) $\ln\left(\frac{3}{2}\right)$

(b) $\ln\left(\frac{4}{3}\right)$

(c) $\ln\left(\frac{\pi}{4}\right)$

(d) $\ln\left(\frac{\pi}{8}\right)$

(e) $\ln\left(\frac{\pi}{12}\right)$

4. Determine the value of the positive number b for which the average value of the function $f(x) = 2 + 6x$ on the interval $[0, b]$ is 3.

(a) 1/3

(b) 3

(c) $\dfrac{\sqrt{10}-1}{3}$

(d) 2

(e) 1/6

5. Compute the indefinite integral $\displaystyle\int xe^{-2x}\,dx$.

(a) $\dfrac{x^2e^{-2x}}{2} + C$

(b) $-\dfrac{xe^{-3x}}{3} - \dfrac{e^{-3x}}{9} + C$

(c) $xe^{-2x} + e^{-2x} + C$

(d) $xe^{-3x} + e^{-3x} + C$

(e) $-\dfrac{xe^{-2x}}{2} - \dfrac{e^{-2x}}{4} + C$

6. Compute the indefinite integral $\int 2\sin^2\theta\, d\theta$.

(a) $\dfrac{\theta}{2} + \dfrac{\sin(2\theta)}{4} + C$

(b) $\theta + \dfrac{\sin(2\theta)}{2} + C$

(c) $\dfrac{\theta}{2} - \dfrac{\sin(2\theta)}{4} + C$

(d) $\theta - \dfrac{\sin(2\theta)}{2} + C$

(e) $\theta + 2\sin(2\theta) + C$

7. Calculate the area of the region enclosed by the x-axis, $y = \ln x$, $x = e$, and $x = e^2$.

(a) $2e^3$

(b) e^2

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

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

(e) $3/2$

8. An aquarium 2 m long, 1 m wide, and 1 m deep is full of water. Find the work needed to pump half the water out of the aquarium. (The density of water, ρ, is 1000 kg/m^3, and acceleration due to gravity, g, is 9.8 m/s^2.)

(a) 4.9 J

(b) 9.8×10^3 J

(c) 2.45 J

(d) 250 J

(e) 2.45×10^3 J

9. Let R denote the region enclosed by the y-axis, the line $y = 1$, and the curve $y = \sqrt{x}$. Compute the volume of the solid whose base is R and whose cross sections perpendicular to the y-axis are semicircles.

(a) $\pi/24$

(b) $\pi/10$

(c) $\pi/20$

(d) $\pi/40$

(e) $\pi/2$

10. Suppose that f is continuous on $(-\infty, \infty)$, and that F is an antiderivative of f in $(-\infty, \infty)$. Which of following is an antiderivative of the function $g(x) = f(2x - 3)$?

(a) $F(2x - 3)$

(b) $\dfrac{F(3x - 2)}{3}$

(c) $\dfrac{F(2x - 3)}{2}$

(d) $F(3x - 2)$

(e) insufficient information to make a determination

Part 2 (56 points)

Present your solutions to the following problems (11–16) 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.*

11. (`10 points`) Compute the following integral:

$$\int \tan^3 x \sec^3 x \, dx$$

12. (`10 points`) Compute the following integral:

$$\int \frac{\sin^3(\sqrt{x})}{\sqrt{x}}\, dx$$

13. (`10 points`) Let R denote the region bounded by the parabola $y = 1 - x^2$ and the straight line $y = 2x - 2$. Sketch R and calculate its area.

14. (`10 points`) Let T denote the triangular region with vertices at $(0,0)$, $(2,1)$ and $(3,1)$. Sketch T and use the method of *disks* to compute the volume of the solid obtained by rotating T about the y-axis.

15. (`10 points`) Let R denote the region enclosed (in the first quadrant) by the x-axis, the line $x = 1$, and the curve $y = x^3$. Sketch R and use the method of *cylindrical shells* to calculate the volume of the solid obtained by rotating R about the line $\underline{x = 1}$.

16. (`6 points`) Let f be a function such that f'' is continuous in the interval $[0, \pi]$. Given that

$$f(0) = 1, \quad f(\pi) = -1, \quad \text{and} \quad \int_0^\pi f(x) \sin x \, dx = 3,$$

evaluate

$$\int_0^\pi f''(x) \sin x \, dx.$$

QN	PTS
1–10	
11	
12	
13	
14	
15	
16	
TOTAL	