MATH 152, Spring 2009
COMMON EXAM II - VERSION A

LAST NAME, First name (print): _____

INSTRUCTOR: _____

SECTION NUMBER: _____

UIN: _____

SEAT NUMBER: _____

DIRECTIONS:

1. The use of a calculator, laptop or computer is prohibited.
2. In Part 1 (Problems 1-10), mark the correct choice on your ScanTron using a No. 2 pencil. *For your own records, also record your choices on your exam!*
3. In Part 2 (Problems 11-15), present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate your final answer.* 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.*

THE AGGIE CODE OF HONOR

"An Aggie does not lie, cheat or steal, or tolerate those who do."

Signature: _____

DO NOT WRITE BELOW!

Question	Points Awarded	Points
1-10		40
11		12
12		12
13		12
14		12
15		12
		100

PART I: Multiple Choice

1. (4 pts) Find the length of the curve $y = \sqrt{x^3}$ from the point $(0, 0)$ to the point $(4, 8)$.

   (a) $\frac{3}{2}(10\sqrt{10} - 1)$

   (b) $\frac{4}{9}$

   (c) $\frac{2}{3}(10\sqrt{10} - 1)$

   (d) $\frac{8}{27}(10\sqrt{10} - 1)$

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

2. (4 pts) The improper integral $\int_0^\infty xe^{-3x}\,dx$

   (a) Converges to 9

   (b) Converges to $\frac{1}{9}$

   (c) Converges to 0

   (d) Converges to $-\frac{1}{9}$

   (e) Diverges

3. (4 pts) $\displaystyle\int_1^2 \frac{x^2+1}{x^2+x}\,dx =$

(a) $1 + 3\ln 2 - 2\ln 3$

(b) $1 - 3\ln 2 + 2\ln 3$

(c) $2 + 3\ln 2 - 2\ln 3$

(d) $2 - 3\ln 2 + 2\ln 3$

(e) None of the above.

4. (4 pts) Find the surface area obtained by rotating the curve $y = 4 - x^2$, $0 \le x \le 2$, around the y-axis.

(a) $\dfrac{\pi}{6}(5\sqrt{5} - 1)$

(b) $\dfrac{4\pi}{3}(17\sqrt{17} - 1)$

(c) $\dfrac{4\pi}{3}(5\sqrt{5} - 1)$

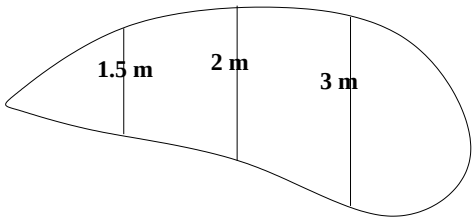
(d) $\dfrac{\pi}{6}$

(e) $\dfrac{\pi}{6}(17\sqrt{17} - 1)$

5. (4 pts) Using the error bound formula $|E_T| \leq \dfrac{K(b-a)^3}{12n^2}$, where $K = \max|\mathrm{f}''(\mathrm{x})|$ for $a \leq x \leq b$, what is the smallest value of n so that the approximation T_n (The trapezoidal rule with n subintervals) to the integral $\displaystyle\int_1^3 \ln x \, dx$ is accurate to within $\dfrac{1}{2400}$?

   (a) $n = 40$
   (b) $n = 20$
   (c) $n = 60$
   (d) $n = 30$
   (e) $n = 70$

6. (4 pts) A group of calculus teachers were sitting around an odd shaped pool (see figure below). The widths (in meters) of this pool were measured at 2-meter intervals as indicated. Use Simpson's rule with $n = 4$ to approximate the area of this pool.



   (a) 22 square meters
   (b) $\dfrac{22}{3}$ square meters
   (c) $\dfrac{17}{3}$ square meters
   (d) $\dfrac{17}{2}$ square meters
   (e) $\dfrac{44}{3}$ square meters

7. (4 pts) The integral $\displaystyle\int_1^\infty \frac{dx}{x+e^{5x}}$

(a) Diverges by comparison to $\displaystyle\int_1^\infty \frac{dx}{x}$

(b) Converges by comparison to $\displaystyle\int_1^\infty \frac{dx}{e^{5x}}$

(c) Diverges by comparison to $\displaystyle\int_1^\infty \frac{dx}{e^{5x}}$

(d) Converges by comparison to $\displaystyle\int_1^\infty \frac{dx}{x}$

(e) Converges to 0.

8. (4 pts) Given $\dfrac{du}{dt} = e^{2t-u}$ and $u(0) = 1$, find $u(1)$.

(a) $u(1) = \ln(\frac{1}{2}e^2 + e - \frac{1}{2})$

(b) $u(1) = \ln(e+1)$

(c) $u(1) = \ln(2e^2 + e - 2)$

(d) $u(1) = \ln(\frac{1}{2}e^2 - e + \frac{1}{2})$

(e) $u(1) = \ln(e-1)$

9. (4 pts) Find the surface area obtained by rotating the curve $x = \sin t$, $y = \cos t$, $0 \le t \le \dfrac{\pi}{3}$ around the x-axis.

(a) π

(b) $\pi\dfrac{\sqrt{3}}{2}$

(c) $\pi\sqrt{3}$

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

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

10. (4 pts) The curve $x = e^{8y}$, $0 \le y \le 1$ is revolved around the x-axis. Which of the following integrals gives the resulting surface area?

(a) $\displaystyle\int_0^1 2\pi y\sqrt{1+\frac{1}{64}e^{16y}}\,dy$

(b) $\displaystyle\int_0^1 2\pi e^{8y}\sqrt{1+\frac{1}{64}e^{16y}}\,dy$

(c) $\displaystyle\int_0^1 2\pi y\sqrt{1+64e^{16y}}\,dy$

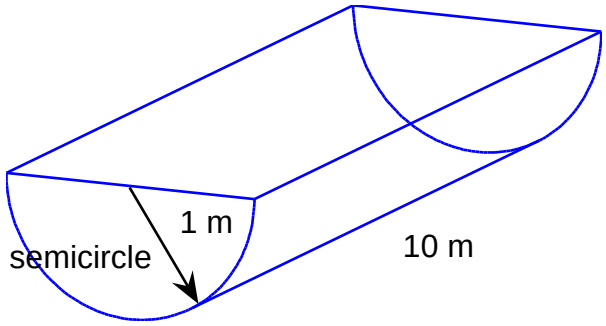
(d) $\displaystyle\int_0^1 2\pi e^{8y}\sqrt{1+64e^{16y}}\,dy$

(e) $\displaystyle\int_0^1 2\pi e^{8y}\sqrt{1+\frac{1}{64}e^{8y^2}}\,dy$

PART II WORK OUT

Directions: Present your solutions in the space provided. *Show all your work* neatly and concisely and *Box your final answer*. 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. (12 pts) A tank is full of oil and has the shape below. Find the hydrostatic force against one end of the semi-circular tank. Note the weight density of oil is $\rho g = 9000$ Newton's per cubic meter.



12. A tank contains 250 liters of pure water. Brine that contains 0.01 kg of salt per liter enters the tank at a rate of 20 liters per minute. The solution is kept mixed and drains from the tank at a rate of 20 liters per minute. How much salt is in the tank after t minutes?

13. (12 pts) Find $\displaystyle\int \frac{x+2}{x^2(x^2+1)}\,dx$

14. (12 pts) Find a general solution to the differential equation $x\dfrac{dy}{dx} = x(\ln x)^2 + y$.

15. (12 pts) Find the centriod of the region bounded by $y = \sqrt{x}$ and $y = x^3$. Simplify your answer.

End of Exam