

**MATH 152, SPRING 2006
COMMON EXAM II - VERSION A**

LAST NAME, First Name (print): _____

INSTRUCTOR: _____

SECTION NUMBER: _____

UIN: _____

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 form No. 815-E using a No. 2 pencil. *For your own records, also record your choices on your exam!* ScanTrons will be collected from all examinees after 90 minutes and will not be returned.
3. In Part 2 (Problems 11-14), 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		50
11		12
12		12
13		14
14		12
		100

PART I

1. (5 pts) The curve C is given by the parametric equations $x = t^2$, $y = t^2 + t$ for $0 \leq t \leq 1$. Which integral gives the length of the curve C ?

(a) $\int_0^1 \sqrt{t^2 + 2t^3 + 2t^4} dt$

(b) $\int_0^1 \sqrt{1 + t^2 + 2t^3 + 2t^4} dt$

(c) $\int_0^1 \sqrt{1 + 4t + 8t^2} dt$

(d) $\int_0^1 \sqrt{2 + 4t + 8t^2} dt$

(e) $\int_0^1 \sqrt{2 + 4t} dt$

2. (5 pts) Which differential equation is not separable?

(a) $\frac{dy}{dx} = (\sin x)(\cos y)$

(b) $\frac{dy}{dx} = xy + x^2y$

(c) $\frac{dy}{dx} = xy^2 + x^2y$

(d) $\frac{dy}{dx} = e^{x+y}$

(e) $\frac{dy}{dx} = 1 + x + y + xy$

Exam continues on next page

3. (5 pts) An integrating factor for the differential equation $y' + (2 \sin 2x)y = \cos 4x$ is

(a) $-\cos(2x)$

(b) $\sin(2x)$

(c) $e^{\frac{1}{4} \sin(4x)}$

(d) $e^{-\cos(2x)}$

(e) $e^{\sin(2x)}$

4. (5 pts) A tank contains 100 L of pure water. Brine that contains 0.1 kg of salt per liter enters the tank at a rate of 10 L/min. The solution is kept thoroughly mixed and drains from the tank at the same rate. If $y(t)$ is the quantity of salt in kilograms dissolved in the tank at time t , then y satisfies

(a) $\frac{dy}{dt} = 1 - \frac{y}{10}$, $y(0) = 0.1$

(b) $\frac{dy}{dt} = 1 - \frac{y}{10}$, $y(0) = 0$

(c) $\frac{dy}{dt} = -\frac{y}{10}$, $y(0) = 0$

(d) $\frac{dy}{dt} = -\frac{y}{100}$, $y(0) = 0.1$

(e) $\frac{dy}{dt} = 10 - \frac{y}{100}$, $y(0) = 0$

Exam continues on next page

5. (5 pts) Which statement about $\int_1^{\infty} \frac{x}{1+x^4} dx$ is true?

(a) converges by comparison to $\int_1^{\infty} \frac{1}{x^3} dx$

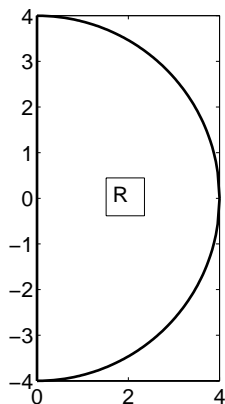
(b) diverges by comparison to $\int_1^{\infty} \frac{1}{x^3} dx$

(c) converges by comparison to $\int_1^{\infty} \frac{1}{x} dx$

(d) diverges by comparison to $\int_1^{\infty} \frac{1}{x} dx$

(e) diverges by comparison to $\int_1^{\infty} x dx$

6. (5 pts) Find the x -coordinate of the center of mass of the semi-circular plate of radius 4, shown as the region \mathbf{R} in the accompanying figure.



(a) 36

(b) $\frac{16}{3\pi}$

(c) 54

(d) $\frac{27}{\pi}$

(e) π

Exam continues on next page

For problems 7 and 8 refer to the following table of function values.

x	0.00	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
$f(x)$	1.00	0.50	0.25	0.75	0.40	0.30	0.20	0.10	0.70

7. (5 pts) Calculate the trapezoid approximation of $\int_0^2 f(x) dx$ for the partition of $0 \leq x \leq 2$ into *four* equal sub-intervals.

- (a) 1.60
- (b) 1.75
- (c) 1.00
- (d) 0.825
- (e) 0.85

8. (5 pts) Calculate the midpoint approximation of $\int_0^2 f(x) dx$ for the partition of $0 \leq x \leq 2$ into *four* equal sub-intervals.

- (a) 1.00
- (b) 0.85
- (c) 0.825
- (d) 1.60
- (e) 1.75

Exam continues on next page

9. (5 pts) Find the general solution of $\frac{dy}{dx} = (2 + 3x^2)(y^2 + 1)$.

(a) $y = 2x + x^3 + C$

(b) $y = \sin(2x + x^3 + C)$

(c) $y = \sin(2x + x^3)$

(d) $y = \tan(2x + x^3) + C$

(e) $y = \tan(2x + x^3 + C)$

10. (5 pts) If $\frac{dy}{dx} = 2y$ and $y(0) = 4$, then $y(1) =$

(a) $2e^4$

(b) $4e^4$

(c) $4 \ln 2$

(d) $4e^2$

(e) $2e^2$

Exam continues on next page

PART II

11. (12 pts) Calculate the length of the curve $y = \frac{x^2}{4} - \frac{\ln x}{2}$ from $x = 1$ to $x = 2$.

Exam continues on next page

12. (12 pts) Solve the differential equation $xy' + 2y = x^3$ with the initial condition $y(-1) = 2$.

Exam continues on next page

13. Evaluate each of the following improper integrals if it converges or explain why it diverges.

(a) (7 pts) $\int_0^{\infty} \frac{x}{1+x^2} dx$

(b) (7 pts) $\int_0^2 \frac{1}{\sqrt{4-x^2}} dx$

Exam continues on next page

14. (12 pts) Find the area of the surface obtained by rotating the curve $y = x^3$ over $0 \leq x \leq 1$ about the x -axis.

End of exam