MATH 152, SPRING 2006
COMMON EXAM II - VERSION B

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 $0 \le t \le 1$. Which integral gives the length of the curve C?

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

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

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

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

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

2. (5 pts) Which differential equation is <u>not</u> separable?

   (a) $\dfrac{dy}{dx} = 1 + x + y + xy$

   (b) $\dfrac{dy}{dx} = (\sin x)(\cos y)$

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

   (d) $\dfrac{dy}{dx} = xy^2 + x^2 y$

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

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

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

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

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

(b) $\dfrac{dy}{dt} = -\dfrac{y}{100}$, $y(0) = 0.1$

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

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

(e) $\dfrac{dy}{dt} = 1 - \dfrac{y}{10}$, $y(0) = 0$

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

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

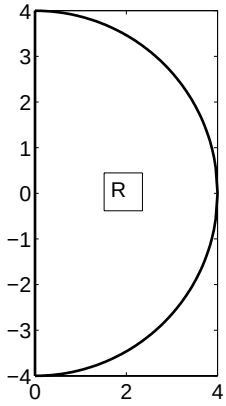
(b) diverges by comparison to $\displaystyle\int_1^\infty \frac{1}{x^3}\,dx$

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

(d) diverges by comparison to $\displaystyle\int_1^\infty x\,dx$

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

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) π

(b) $\dfrac{27}{\pi}$

(c) 36

(d) $\dfrac{16}{3\pi}$

(e) 54

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

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

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

(a) $y = \sin(2x + x^3)$
(b) $y = \sin(2x + x^3 + C)$
(c) $y = 2x + x^3 + C$
(d) $y = \tan(2x + x^3 + C)$
(e) $y = \tan(2x + x^3) + C$

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

(a) $4e^2$
(b) $4 \ln 2$
(c) $4e^4$
(d) $2e^2$
(e) $2e^4$

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PART II

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

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

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

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

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

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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