Student (Print) _____   Section _____

                Last, First Middle

Student (Sign) _____

Student ID   _____

Instructor   _____

MATH 152,   Fall 2007
Common Exam 2
Test Form B

Instructions:

    You may not use notes, books, calculator or computer.

Part I is multiple choice. There is no partial credit.

    Mark the Scantron with a #2 pencil. For your own records,
also circle your choices in this exam. Scantrons will be collected
after 90 minutes and may not be returned.

Part II is work out. Show all your work. Partial credit will be given.

THE AGGIE CODE OF HONOR:
An Aggie does not lie, cheat or steal, or tolerate those who do.

For Dept use Only:	
1-10	/50
11	/10
12	/10
13	/10
14	/10
15	/10
TOTAL	

Part I: Multiple Choice (5 points each)

There is no partial credit.

1. Use the Trapezoid Rule with 3 intervals to approximate $\int_1^7 x^2\, dx$.

    a. 59

    b. 84

    c. 114

    d. 118

    e. 168

2. If you use the trapezoid rule with 47 intervals to estimate $\int_0^{94} e^{x^3}\, dx$ your answer will be

    a. too large because e^{x^3} is concave down.

    b. too large because e^{x^3} is concave up.

    c. too small because e^{x^3} is concave up.

    d. too small because e^{x^3} is increasing.

    e. too small because e^{x^3} is decreasing.
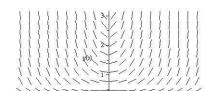
3. Find the integrating factor for $\dfrac{dy}{dx} - \dfrac{4}{x}y = x^2$

    a. x^{-4}

    b. $-4\ln x$

    c. x^4

    d. $4\ln x$

    e. $-\dfrac{1}{3}x^{-3}$

4. Compute $\displaystyle\int_0^{\pi/2} \sec^2\theta \, d\theta$

  a. -1

  b. 0

  c. 1

  d. 2

  e. diverges

5. Compute $\displaystyle\int_{-1}^{4} \frac{1}{x^2} \, dx$

  a. $-\dfrac{5}{4}$

  b. 0

  c. $\dfrac{3}{4}$

  d. $\dfrac{5}{4}$

  e. diverges

6. The integral $\displaystyle\int_{\pi}^{\infty} \frac{3 + \sin(x)}{x} \, dx$ is

  a. divergent by comparison with $\displaystyle\int_{\pi}^{\infty} \frac{4}{x} \, dx$.

  b. divergent by comparison with $\displaystyle\int_{\pi}^{\infty} \frac{3}{x} \, dx$.

  c. divergent by comparison with $\displaystyle\int_{\pi}^{\infty} \frac{2}{x} \, dx$.

  d. convergent by comparison with $\displaystyle\int_{\pi}^{\infty} \frac{4}{x} \, dx$.

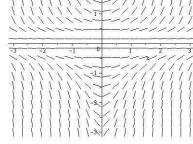 **e.** convergent by comparison with $\displaystyle\int_{\pi}^{\infty} \frac{2}{x} \, dx$.

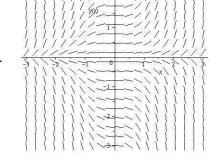**7.** Which of the following diagrams is the direction field of the differential equation $\dfrac{dy}{dx} = x^2 y$?
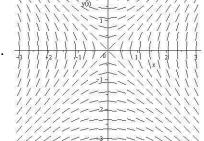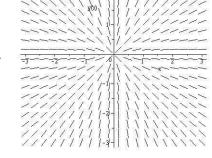
a.

d.

b.

e.

c.

8. Suppose the function $y = f(x)$ is the solution of $\dfrac{dy}{dx} = x^2 - y^2$ satisfying the initial condition $f(1) = 2$. Find $f'(1)$.

a. -3

b. -2

c. -1

d. 1

e. 2

4

9. Find the length of the curve $x = 2t^2$, and $y = t^3$ for $0 \le t \le 1$.

    a. $\dfrac{1}{3}$

    b. $\dfrac{61}{27}$

    c. 7

    d. 108

    e. 732

10. The curve $y = \sin x$ for $0 \le x \le \pi$ is rotated about the x-axis. Which formula gives the area of the resulting surface?

    a. $\displaystyle\int_0^\pi \pi \cos x \sqrt{1 + \sin^2 x}\ dx$

    b. $\displaystyle\int_0^\pi 2\pi \cos x \sqrt{1 + \sin^2 x}\ dx$

    c. $\displaystyle\int_0^\pi \pi \sin x \sqrt{1 + \cos^2 x}\ dx$

    d. $\displaystyle\int_0^\pi 2\pi \sin x \sqrt{1 + \cos^2 x}\ dx$

    e. $\displaystyle\int_0^\pi \pi \sin x\ dx$

Show all your work. Partial credit will be given.

11. Compute $\displaystyle\int_1^\infty \frac{\ln x}{x^2}\,dx$

12. Simpson's Error Formula says:

The error E_S in approximating $\displaystyle\int_a^b f(x)\,dx$ with n intervals satisfies

$$|E_S| \le \frac{K(b-a)^5}{180n^4} \qquad \text{where} \quad K \ge \max\left|f^{(4)}(x)\right| \quad \text{for} \quad a \le x \le b.$$

Use this formula to estimate the error in approximating $\displaystyle\int_1^4 \frac{1}{x}\,dx$ using $n = 30$ intervals.

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13. Find the centroid of the region in the first quadrant bounded by $y = 2\sqrt{x}$, the x-axis and $x = 4$.

14. Consider the differential equation: $\dfrac{dy}{dx} = \dfrac{xy}{x^2 + 16}$

   a. Find the general solution:

   b. Find the solution satisfying the initial condition: $\quad y(0) = 8$

   c. Find $y(3)$:

15. A salt water fish tank contains 20 liters of water with 800 grams of salt. In order to reduce the salt concentration, you pour in salt water with a concentration of 15 grams of salt per liter at 2 liters per minute. You keep the tank well mixed and drain the mixture at 2 liters per minute. Let $S(t)$ be the amount of salt (in grams) in the tank at time t (in minutes).

    a. Write the differential equation and initial condition for $S(t)$.

    b. Solve the initial value problem for $S(t)$.

    c. After how many minutes will the amount of salt in the tank drop to 400 grams?