MATH 162 – FALL 2006 – FIRST EXAM
SEPTEMBER 18, 2006

STUDENT NAME———————————————————————

STUDENT ID———————————————————————

RECITATION INSTRUCTOR———————————————————

RECITATION TIME———————————————————————

INSTRUCTIONS

1. Verify that you have **7 pages.**
2. Fill in the blank spaces above.
3. Use a number 2 pencil to write on your **mark-sense sheet**.
4. **On your mark sense sheet**, write your name, your student ID number, the division and section numbers of your recitation, and fill the corresponding circles.
5. Mark the letter of your response for each question on the **mark-sense sheet.**
6. There are 13 questions. The **first is worth 4 points**. The other 12 **are worth 8 points each**.
7. Show as much as possible of your work. Although this exam will be machine graded, in certain situations it may be necessary that we look at your exam.
8. No books, notes or calculators may be used.

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1) (4 points) The center and the radius of the sphere given by $x^2 + y^2 + z^2 = 4x + 3y$ are

A) Center $(0, 3/2, 2)$ and radius $3/2$

B) Center $(2, 3/2, 0)$ and radius $3/2$

C) Center $(2, 3/2, 0)$ and radius $5/2$

D) Center $(1, 2, 3)$ and radius $2/3$

E) Center $(2, 2/3, 1)$ and radius $5/2$

2) (8 points) The point 1/4 of the way from $(1, -3, 1)$ and $(7, 9, -9)$ is

A) $(4, 3, -4)$

B) $(5/2, 0, -3/2)$

C) $(3/2, 3, -3/2)$

D) $(3/2, 6, -5)$

E) $(11/4, 6, -13/2)$

3) (8 points) The area of the triangle with vertices $(-1, 1, 1)$, $(2, 0, 2)$ and $(3, 2, 2)$ is

A) $\frac{3\sqrt{6}}{2}$

B) $\frac{5\sqrt{6}}{3}$

C) $2\sqrt{3}$

D) $\sqrt{6}$

E) $\frac{\sqrt{3}}{2}$

4)(8 points) Let $\vec{a} = (-5, 4, 3)$ and $\vec{b} = (-1, -1, -2)$. Which one of the following is true?

I) $\text{comp}_{\vec{a}}\,\vec{b} = -5/\sqrt{50}$

II) $\text{comp}_{\vec{b}}\,\vec{a} = -5/\sqrt{50}$

III) $\text{comp}_{\vec{b}}\,\vec{a} = -5/\sqrt{6}$

IV) $\text{comp}_{\vec{a}}\,\vec{b} = -5/\sqrt{6}$

A) I is true, II, III and IV are false

B) I and II are true, III and IV are false

C) I and III are true, II and IV are false

D) III is true, I, II and IV are false

E) II and IV are true, I and II are false

5)(8 points) The area bounded by the curves $y = 6x^2$, and $y = 6x + 12$ in the interval $[0, 3]$ is

A) 3

B) 4

C) 27

D) 31

E) 83

6)(8 points) The area bounded by the curves $y = 12 - 6x^2$ and $y = 6|x|$ is

A) 14

B) 7

C) 8

D) 3

E) 5

7)(8 points) Take the region bounded by the curves $y = x^2$, $y = 2 - x^2$ and $x = 0$, and rotate it about the y-axis. The volume of the solid generated is equal to

A) $\pi/2$

B) $2\pi/3$

C) π

D) $3\pi/2$

E) 2π

8) (8 points) The volume of the solid obtained by rotating the region bounded by the curves $x = -y^2 + 2y$, $x = 1$, $y = 0$ and $y = 2$ about the line $x = 1$ is given by the integral

A) $\pi \int_0^1 (1 - y^2 + 2y)\, dy$
B) $\pi \int_0^2 (1 - y^2 + 2y)\, dy$
C) $\pi \int_0^2 (1 - y^2 + 2y)^2\, dy$
D) $\pi \int_0^1 (1 - y^2 + 2y)^2\, dy$
E) $\pi \int_0^2 (1 + y^2 - 2y)^2\, dy$

9) (8 points) A conical tank T is h meters high and the radius of its base is R meters long. The base of tank T rests on the ground. If the tank is filled with a liquid of density ρ Kg/m^3, the work necessary to empty it by pumping the liquid through its top is (g is the acceleration of gravity)

A) $\rho \pi g R^2 h$

B) $\rho \pi g R^3 h^2/3$

C) $\rho \pi g R h^2/2$

D) $\rho \pi g R^2 h^2/4$

E) $\rho \pi g R^2 h/4$

10) (8 points) The integral

$$\int_1^2 x^{-2} \ln x \, dx \quad \text{is equal to}$$

A) $\frac{3}{4} - \frac{\ln 2}{2}$

B) $\frac{(1-\ln 2)}{2}$

C) $2 - \ln 2$

D) $\ln 2$

E) $\frac{3 \ln 2}{4}$

11) (8 points) The integral

$$\int_0^{\pi/4} x \sin x \, dx \text{ is equal to}$$

A) $\frac{\sqrt{2}}{2}$

B) $\sqrt{2} - \frac{\pi\sqrt{2}}{8}$

C) $\frac{3\sqrt{2}}{2}$

D) $\frac{\sqrt{2}}{4}$

E) $\frac{\sqrt{2}}{2} - \frac{\pi\sqrt{2}}{8}$

12) (8 points) The integral

$$\int_0^{\frac{\pi}{4}} \tan^3 x \sec^2 x \, dx \quad \text{is equal to}$$

A) 1/3

B) 1

C) 3/4

D) 1/4

E) 2/3

13) (8 points) If $\int_0^1 x^2 e^x \, du = A$, then $\int_0^1 x^3 \, e^x \, dx$ is equal to

A) $3A$

B) $2A$

C) $e - A$

D) $6 - 2A$

E) $e - 3A$