MATH 162 – SPRING 2004 – FIRST EXAM
FEBRUARY 12, 2004

STUDENT NAME———————————————————————

STUDENT ID———————————————————————

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

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

INSTRUCTIONS

1. Fill in your name, your student ID number, and your recitation instructor's name and recitation time above. Write your name, your student ID number and division and section number of your recitation section on your answer sheet, and fill in the corresponding circles.
2. Mark the letter of your response for each question on the mark-sense sheet.
3. There are 13 questions, each worth 8 points.
8. No books, notes or calculators may be used.

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**1)** Find the volume of the parallelepiped formed by the vectors

$$\vec{v}_1 = \vec{i} + 2\vec{j} + 2\vec{k}, \quad \vec{v}_2 = \vec{i} + 2\vec{j} + 3\vec{k} \quad \text{and} \quad \vec{v}_3 = \vec{i} - \vec{k}.$$

A) 2

B) 1

C) 0

D) 4

E) 5

2) Find the distance from the point $(1, 1, 2)$ to the center of the sphere

$$x^2 + y^2 + z^2 + 2x - 6y = 100.$$

A) $2\sqrt{2}$

B) 3

C) $\sqrt{3}$

D) $2\sqrt{3}$

E) $\sqrt{2}$

3) If $\theta$ is the angle between $\vec{i} - \vec{j} + \vec{k}$ and $\vec{i} + 2\vec{j} - \vec{k}$ then $\sin^2\theta$ is equal to

A) $\frac{7}{9}$

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

C) $\frac{3}{4}$

D) $\frac{1}{4}$

E) $\frac{1}{2}$

4) The area of the region in the $xy$-plane bounded by the curves $x = 9 - y^2$ and $x = y^2 + 1$ is equal to

A) $\frac{44}{3}$

B) $\frac{64}{3}$

C) $\frac{20}{3}$

D) 18

E) 16.

5) Which of the following integrals represent the volume of the solid generated by revolving about the $x$-axis the region between the graphs of $y = x^2$ and $y = x$.

A) $\pi \int_0^1 (x - x^2)\, dx$

B) $\pi \int_0^1 x^2\, dx$

C) $\pi \int_0^1 (x^2 - x^4)\, dx$

D) $\pi \int_0^1 (x^4 - x^2)\, dx$

E) There is no such integral.

6) The volume of the solid generated by rotating the region bounded by the curves $y = 1 - x^2$, $y = x^2$ and $x = 0$ about the $y$-axis is

A) $\frac{\pi}{3}$

B) $\frac{\pi}{4}$

C) $2\pi$

D) $\frac{\pi}{6}$

E) $\pi$

7) A hemispherical tank with a 5 ft radius contains water to a level of 2 ft from the top of the tank. Find the work in ft-lbs required to pump the water out from an outlet 1 ft above the top of the tank. (Water density is 62.5 lb / ft$^3$.)

A) $(62.5)\pi \int_2^5 (x+1)(25-x^2)\,dx$

B) $(62.5)\pi \int_0^3 (x+1)(25-x^2)\,dx$

C) $(62.5)\pi \int_2^5 x(25-x^2)\,dx$

D) $(62.5)\pi \int_0^5 (x+1)(25-x^2)\,dx$

E) $(62.5)\pi \int_0^3 x(25-x^2)\,dx$

8) Given that $\int_0^{\frac{\pi}{2}} x^3 \cos x \, dx = \frac{\pi^3}{8} - 3\pi + 6$, the value of the integral

$$\int_0^{\frac{\pi}{2}} x^4 \sin x \, dx$$

A) can not be determined

B) is equal to $-4\left(\frac{\pi^3}{8} - 3\pi + 6\right)$

C) is equal to $4\left(\frac{\pi^3}{8} - 3\pi + 6\right)$

D) is equal to $2\left(\frac{\pi^3}{8} - 3\pi + 6\right)$

E) is equal to 4

9) Evaluate $\int_0^{\frac{\pi}{2}} \cos^3 x \sin^3 x \, dx$.

A) $\frac{1}{6}$

B) $\frac{1}{12}$

C) $\frac{1}{4}$

D) $\frac{1}{3}$

E) $\frac{2}{15}$

10) The value of $\int_1^9 \ln \sqrt{x}\, dx$ is

A) $2 \ln 3$

B) $6 \ln 3 - 5$

C) $9 \ln 3 - 4$

D) $6 \ln 3 - 4$

E) $e^3 - 2$.

11) Evaluate $\int_0^{\frac{\pi}{4}} \tan^2 x \sec^4 x\, dx$.

A) $\frac{8}{15}$

B) $\frac{1}{3}$

C) $\frac{2}{15}$

D) $\frac{1}{15}$

E) $\frac{2}{5}$

12) Evaluate $\int_0^1 \frac{x^2}{\sqrt{1-x^6}}\,dx$ (You may need to use the substitution $u = x^3$.)

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

B) $\frac{\pi}{3}$

C) $\frac{\pi}{4}$

D) $\frac{\pi}{6}$

E) $\frac{\pi}{8}$

13) The value of the integral

$$\int_0^1 \frac{-x+5}{x^2-x-2}\,dx$$

A) is $-3\ln 2$

B) is $3\ln 3 - 3\ln 2$

C) is $3\ln 3$

D) is $\ln 2$

E) is $\ln 3$