MA 162 EXAM #1

Name _____

Student ID number _____

Lecturer _____

Recitation Instructor _____

Instructions:

1. This package contains 11 problems, each worth 9 points.

2. Please supply <u>all</u> information requested above and on the mark–sense sheet.

3. Work only in the space provided, or on the backside of the pages. Mark your answers clearly.

4. No books, notes, or calculator, please.

1. Find the center and radius of the sphere whose equation is given by

$$x^2 + y^2 + z^2 - 4x - 2y + 6z + 5 = 0.$$

    A. center $(2, 1, 3)$, radius 5

    B. center $(-2, -1, 3)$, radius 5

    C. center $(2, 1, -3)$, radius 3

    D. center $(2, 1, -3)$, radius 5

    E. center $(-2, -1, 3)$, radius 4

2. If θ is the angle between the vectors $\langle 3, -6, 2 \rangle$ and $\langle -2, 1, 2 \rangle$, then $\cos \theta$ equals

    A. $-\dfrac{8}{21}$

    B. $\dfrac{4}{7}$

    C. $-\dfrac{2}{3}$

    D. $\dfrac{8}{21}$

    E. $-\dfrac{4}{7}$

3. Suppose that a wind from the south is blowing at a speed of 10 miles per hour. A pilot is steering his plane in the direction E30°N (i.e., 30° north of due east) at an airspeed (speed in still air) of 60 miles per hour. Find the ground speed of the plane.

               A. $\sqrt{3100}$ mph

               B. $\sqrt{4300}$ mph

               C. $\sqrt{2800}$ mph

               D. $\sqrt{4700}$ mph

               E. $\sqrt{5200}$ mph

4. Find the area of the parallelogram spanned by the vectors $\langle 2, 3, -1 \rangle$ and $\langle 4, 1, 1 \rangle$.

               A. $\sqrt{152}$

               B. $\sqrt{108}$

               C. $\sqrt{204}$

               D.   152

               E.   108

5. Find a unit vector orthogonal to the plane through the points $P(0,2,1)$, $Q(1,1,0)$, and $R(3,0,1)$.

A. $-2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$

B. $\dfrac{1}{\sqrt{14}}(-2\mathbf{i} - 3\mathbf{j} + \mathbf{k})$

C. $2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$

D. $\dfrac{1}{\sqrt{14}}(2\mathbf{i} + 3\mathbf{j} + \mathbf{k})$

E. $\dfrac{1}{\sqrt{6}}(2\mathbf{i} - 3\mathbf{j} + \mathbf{k})$

6. Find the area of the region bounded by the curves $y = \sin x$, $y = e^{2x}$, $x = 0$ and $x = \frac{\pi}{2}$.

A. $e^{\pi} - 2$

B. $2 - e^{\pi}$

C. $\dfrac{1}{2}(e^{\pi} - 3)$

D. $\dfrac{1}{2}(3 - e^{\pi})$

E. $\dfrac{1}{2}(e^{\pi} + 1)$

7. Let D be the region bounded by the curves $y = x^2 - x - 2$ and $y = x - 2$. Compute the volume of the solid obtained by rotating D about the y-axis.

     A. $\dfrac{14\pi}{3}$

     B. 2π

     C. $\dfrac{32\pi}{3}$

     D. $\dfrac{16\pi}{3}$

   E. $\dfrac{8\pi}{3}$

8. Let D be the region bounded by $y = x + 1$ and $y = x^2 + 1$. Compute the volume of the solid obtained by rotating D around the x-axis.

     A. $\dfrac{7\pi}{15}$

     B. $\dfrac{\pi}{6}$

     C. $\dfrac{\pi}{3}$

     D. $\dfrac{2\pi}{5}$

     E. $\dfrac{11\pi}{15}$

9. Suppose that it takes a force of 2 pounds to stretch a spring 3 inches. Compute the work required to stretch a spring from 6 inches to 12 inches past its natural length.

    A. 6 ft–lbs

    B. $\dfrac{7}{2}$ ft–lbs

    C. 3 ft–lbs

    D. 12 ft–lbs

    E. $\dfrac{7}{4}$ ft–lbs

10. Suppose that a tank has the dimensions (in feet) as shown and that it is filled with water. Compute the work needed to pump the water out of the tank.
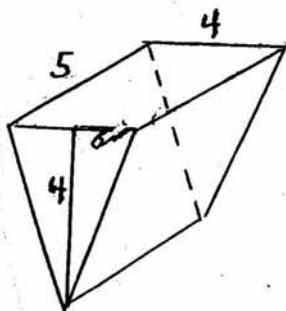
    A. $\dfrac{32}{3}$ (62.5) ft–lbs

    B. 40(62.5) ft–lbs

    C. $\dfrac{40}{3}$ (62.5) ft–lbs

    D. $\dfrac{80}{3}$ (62.5) ft–lbs

    E. 28(62.5) ft–lbs.

11. Compute $\int_0^2 xe^{-2x} dx$

A. $\frac{3}{4} e^{-4}$

B. $\frac{1}{2}(1 + e^{-2})$

C. $\frac{1}{4}(1 - e^{-4})$

D. $\frac{1}{4}(3 - e^{-2})$

E. $\frac{1}{4}(1 - 5e^{-4})$