MA 162 Exam 1 Spring 2005

Name: _____

Student ID: _____

Lecturer: _____

Recitation Instructor: _____

Recitation Time: _____

Instructions:

1. This package contains 12 problems worth 8 points each.
2. Please supply all 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 on the scantron. Also circle your choice for each problem in this booklet.
4. No books, notes, or calculator, please.

MA 162 Exam 1 Spring 2005

1. A unit vector in the same direction as the vector $4\mathbf{i} - 2\mathbf{j} + 4\mathbf{k}$ is

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

   B. $\frac{2}{5}\mathbf{i} - \frac{1}{5}\mathbf{j} + \frac{2}{5}\mathbf{k}$.

   C. $\frac{1}{3}\mathbf{i} + \frac{2}{3}\mathbf{j} - \frac{1}{3}\mathbf{k}$.

   D. $\frac{2}{3}\mathbf{i} - \frac{1}{3}\mathbf{j} + \frac{2}{3}\mathbf{k}$.

   E. $-\frac{1}{5}\mathbf{i} + \frac{3}{5}\mathbf{j} + \frac{2}{5}\mathbf{k}$.

2. Which of the following statements are true?
   ($\mathbf{a}$ and $\mathbf{b}$ are vectors in space).

   I. If $\mathbf{a}$ and $\mathbf{b}$ are orthogonal then $\mathbf{a} \cdot \mathbf{b} = 0$.

   II. If $\mathbf{a}$ and $\mathbf{b}$ are orthogonal then $\mathbf{a} \times \mathbf{b} = 0$.

   III. $\mathbf{a} \times \mathbf{b}$ is orthogonal to $\mathbf{a}$ and $\mathbf{b}$.

   A. only I

   B. only III

   C. only I and III

   D. only I and II

   E. all are true

3. The area of the parallelogram determined by the vectors $\langle 1, -2, 1\rangle$ and $\langle 1, 2, 0\rangle$ is

A. 21

B. $\sqrt{21}$

C. 18

D. $\sqrt{18}$

E. 6

4. The area of the region enclosed by the curve $y = e^x$ and the lines $y = -1 - x$, $x = -1$ and $x = 0$ is

A. $\frac{3}{2} - \frac{1}{e}$

B. $\frac{2}{3e}$

C. $3 + \frac{2}{e}$

D. $2 - \frac{1}{3e}$

E. $3 + \frac{1}{2e}$

5. The region enclosed by the curve $y = \sin x \quad (0 \leq x \leq \pi)$ and the x axis is rotated about the line $y = -1$. The volume of the solid thus generated is

A. $2\pi \int_0^{\pi} (\sin^2 x - 1)^2 \, dx$

B. $\pi \int_0^{\pi} (1 + \sin^2 x) \, dx$

C. $2\pi \int_0^{\pi} x(1 + \sin x) \, dx$

D. $2\pi \int_0^{\pi} x(1 + \sin x)^2 \, dx$

E. $\pi \int_0^{\pi} \{(1 + \sin x)^2 - 1\} \, dx$

6. If the region under the curve $y = 3x^4$ and above the x axis, $-2 \leq x \leq 2$ is rotated about the y axis, the solid generated will have volume

A. 25π

B. 48π

C. 16π

D. 64π

E. 32π

7. If it takes 6 ft-lbs of work to stretch a spring from natural length to a distance 6 in beyond, how much work is required to stretch the spring from 6 in to 1 ft beyond natural length? (1 ft = 12 in)

A. 12 ft-lbs

B. 15 ft-lbs

C. 18 ft-lbs

D. 21 ft-lbs

E. 24 ft-lbs

8. A uniform cable, 30 ft long, weighs 60 lbs and hangs over the edge of a tall building. How much work is done in pulling the cable to the top?

A. 900 ft-lbs

B. 600 ft-lbs

C. 300 ft-lbs

D. 1500 ft-lbs

E. 1800 ft-lbs

9. Evaluate $\int_1^2 x^2 \ln x \, dx$.

A. $8 \ln 2 - \frac{7}{3}$

B. $\frac{4}{3} \ln 2 - \frac{2}{9}$

C. $3 \ln 2 - \frac{7}{9}$

D. $\frac{8}{3} \ln 2 - \frac{7}{9}$

E. $3 \ln 2 - 3$

10. Evaluate $\int_0^{\frac{\pi}{4}} \sec^4 x \, dx$.

A. $\frac{4}{5}$

B. $\frac{6}{5}$

C. $\frac{1}{5}$

D. 1

E. $\frac{4}{3}$

11. Evaluate $\displaystyle\int \frac{x-1}{(x-2)(x+1)}dx.$

A. $\ln\left|\frac{1}{3}(x-2)\right| + \ln\left|\frac{2}{3}(x+1)\right| + C$

B. $\frac{1}{3}\ln|2(x-2)(x+1)| + C$

C. $\frac{1}{3}\ln\left|(x-2)(x+1)^2\right| + C$

D. $\ln|(x-2)(x+1)| + C$

E. $\ln|(x-2)(x+1)| - \ln|x-1| + C$

12. The substitution best suited for integrating $\displaystyle\int \sqrt{1-4x^2}\,dx$ is

A. $x = 2\sin u$

B. $x = 2\sec u$

C. $x = \frac{1}{2}\tan u$

D. $x = \frac{1}{2}\sin u$

E. $x = \frac{1}{2}\sec u$