MA 261 EXAM 1 Fall 2007

Name ____________________

Student ID ____________________

Recitation Instructor ____________________

Recitation Time ____________________

Directions

1. Write your name, student ID number, recitation instructor's name and recitation time in the spaces provided above.
2. 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.
3. Mark the letter of your answer for each question on the answer sheet as well as in the test papers.
4. The exam has 12 problems. Problem 1–8 are worth 8 points and problem 9–12 are worth 9 points each.
5. No books, notes or calculators may be used in this exam.

Key acdd eacb bedc

1. The projection of the vector $\mathbf{v} = \mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ onto the vector $\mathbf{b} = \mathbf{i} + \mathbf{j}$ is

A. $\text{proj}_{\mathbf{b}}\,\mathbf{v} = -\mathbf{i} - \mathbf{j}$

B. $\text{proj}_{\mathbf{b}}\,\mathbf{v} = \dfrac{1}{\sqrt{2}}(\mathbf{i} + \mathbf{j})$

C. $\text{proj}_{\mathbf{b}}\,\mathbf{v} = \dfrac{1}{2}(\mathbf{i} + \mathbf{j})$

D. $\text{proj}_{\mathbf{b}}\,\mathbf{v} = \dfrac{1}{\sqrt{2}}(\mathbf{i} - \mathbf{j})$

E. $\text{proj}_{\mathbf{b}}\,\mathbf{v} = \dfrac{1}{2}(\mathbf{i} - \mathbf{j})$

2. The area of the triangle with vertices at $(a, 0, 0)$, $(0, 2a, 0)$ and $(0, 0, 3a)$ is

A. $A = \dfrac{3a^2}{2}$

B. $A = 5a^2$

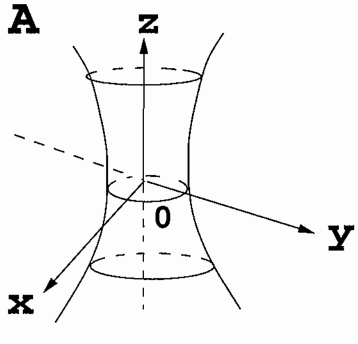
C. $A = \dfrac{7a^2}{2}$

D. $A = 6a^3$

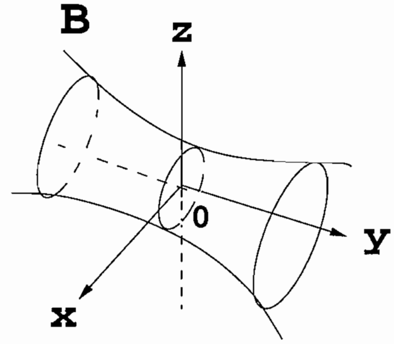
E. $A = \dfrac{3a^3}{2}$

3. The graph of the surface $x^2 - \frac{y^2}{4} + \frac{z^2}{9} = -1$ looks most like :

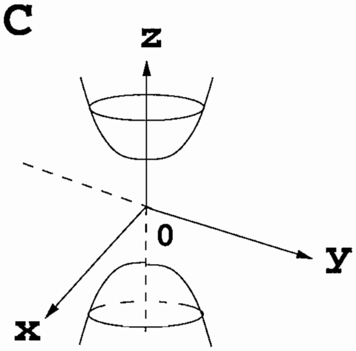
A



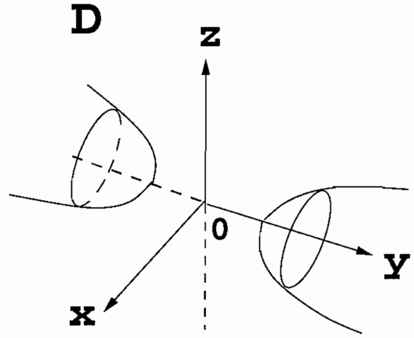
B



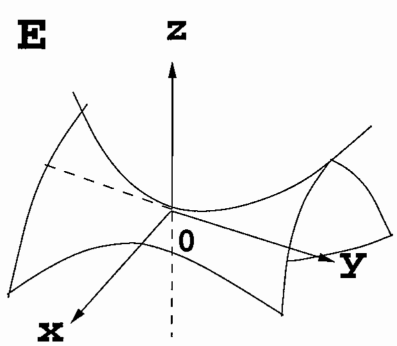
C



D



E



4. A line L contains the point $(1,2,-1)$ and is perpendicular to the plane $3x+y-5z=1$. What point on L intersects the plane $y=0$?

A. $(9,0,-5)$

B. $(-9,0,5)$

C. $(5,0,-9)$

D. $(-5,0,9)$

E. There is no point of intersection

5. Find spherical coordinates (ρ,θ,ϕ) for the point P whose rectangular coordinates are $\left(\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}},\sqrt{3}\right)$:

A. $\left(1,\frac{\pi}{4},\frac{\pi}{3}\right)$

B. $\left(1,\frac{\pi}{3},\frac{\pi}{4}\right)$

C. $\left(3,\frac{\pi}{4},\frac{\pi}{4}\right)$

D. $\left(2,\frac{\pi}{3},\frac{\pi}{4}\right)$

E. $\left(2,\frac{\pi}{4},\frac{\pi}{6}\right)$

6. The unit tangent vector to the curve $\mathbf{r}(t) = \langle \cos t, \sin 3t, e^t \rangle$ at the point $(1, 0, 1)$ is:

A. $\langle 0, \frac{3}{\sqrt{10}}, \frac{1}{\sqrt{10}} \rangle$

B. $\langle 0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \rangle$

C. $\langle 0, \frac{-1}{\sqrt{2}}, \frac{-1}{\sqrt{2}} \rangle$

D. $\langle 0, \frac{-1}{\sqrt{2}}, 0, \frac{1}{\sqrt{2}} \rangle$

E. $\langle \frac{-\sqrt{3}}{10}, 0, \frac{1}{10} \rangle$

7. Find the length of the curve

$$\mathbf{r}(t) = \langle 2t, \frac{4}{3}t^{\frac{3}{2}}, \frac{1}{2}t^2 \rangle, \ 0 \leq t \leq 2$$

A. 2

B. 4

C. 6

D. 8

E. 10

8. Evaluate

$$\lim_{(x,y)\to(2,0)} x^2 e^{-y^2}$$

A. -4

B. 4

C. 0

D. e^{-4}

E. does not exist

9. Find the domain of

$$f(x,y) = \ln\left(\frac{x}{y+2}\right)$$

A. $y \neq -2,\ x > 0$

B. $y > -2,\ x > 0$ or $y < -2,\ x < 0$

C. $y > -2,\ x > 0$

D. $y > 0,\ x > 0$

E. $y > 0,\ x > 0$ or $y < -2,\ x < 0$

10. Compute the tangent plane of the surface $z = 2xy^2 - \frac{x}{y}$ at $(2, 1, 2)$

A. $z = x - 5y + 5$

B. $z = x - 6y$

C. $z = x + 5y - 5$

D. $z = 2x + y - 3$

E. $z = x + 10y - 10$

11. If $z = x^2 + y^4$ and $x = -2v$ and $y = u - v$, compute $\frac{\partial z}{\partial v}$ at $(u, v) = (2, 1)$.

A. -4

B. -12

C. 0

D. 4

E. 12

12. Find the rate of change of the function $f(x, y) = 2x + 3y$ at the point $(1, 2)$ in the direction of the vector $\mathbf{v} = 3\mathbf{i} + \mathbf{j}$.

A. $\frac{3}{10}$

B. $\frac{9}{10}$

C. $\frac{9}{\sqrt{10}}$

D. 9

E. $\frac{-3}{\sqrt{10}}$