MA 261 – Test 1

Name______________________________ TA: ______________________________________

Instructions

1. There are 16 multiple choice problems each of which is worth 6 points except the last problem is worth 10 points.

2. Use a #2 pencil to fill in the little circles on the mark-sense sheet.

3. Be sure that you fill in the correct division-section number. Ask your TA in case of doubt.

4. Do all your work on the space provided for each problem. No calculator or books are allowed.

5. Return this booklet and your mark-sense sheet to your Recitation Instructor.

1. Find x so that the vector $\mathbf{a} = \mathbf{i} + 2x\mathbf{j} + x^2\mathbf{k}$ is perpendicular to $\mathbf{b} = \mathbf{i} + \mathbf{j} + \mathbf{k}$.

A. $x = 1$

B. $x = 0$

C. $x = 2$

D. $x = -2$

E. $x = -1$

2. Find $x > 0$ so that the area of the triangle with vertices $(0,0,0)$, $(1,1,1)$, $(x,2x,3x)$ is 1. $x =$

A. $\frac{1}{\sqrt{6}}$

B. $\frac{1}{2}$

C. $\frac{2}{\sqrt{6}}$

D. $\frac{2}{\sqrt{3}}$

E. $\frac{3}{\sqrt{6}}$

3. Determine a so that the line

$$\frac{x-3}{a} = \frac{y+5}{2} = \frac{z+1}{4}$$

is parallel to the plane $2x + 3y - 5z = 14$. $a =$

A. 7

B. 3

C. -4

D. -5

E. -14

4. The vector valued function $\mathbf{r}(t) = \langle 2\sin t, 4\cos t, 6\rangle$, $-\pi \leq t \leq \pi$, describes

A. circle in a horizontal plane

B. circle in a vertical plane

C. ellipse in a horizontal plane

D. ellipse in a vertical plane

E. spiral in a horizontal plane

5. In spiral coordinates the equations

$$\varphi = \frac{\pi}{2}, \qquad \theta = \frac{\pi}{2}$$

describes

A. a sphere

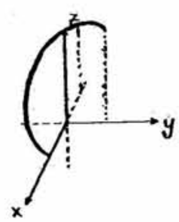
B. a cone

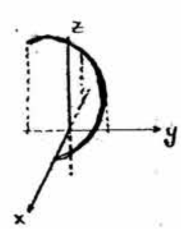
C. a plane

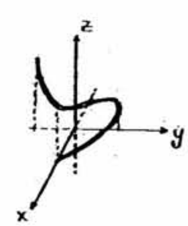
D. a circle

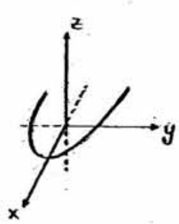
E. the positive y–axis

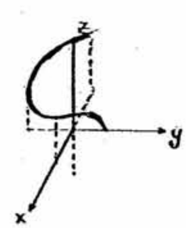
6. The graph of $\mathbf{r}(t) = \langle \cos^2 t, \sin t, |t|\rangle$, $\quad 0 \leq t \leq \dfrac{3\pi}{2}$, looks most like

A. 

B. 

C. 

D. 

E. 

7. One vector parallel to the tangent to the curve

$$x = 4\sqrt{t},\ y = t^2 - 2,\ z = \frac{4}{t}$$

at the point $(4, -1, 4)$ is

A. $4\mathbf{i} - 9\mathbf{j} + 4\mathbf{k}$

B. $8\mathbf{i} + 6\mathbf{j} + \mathbf{k}$

C. $2\mathbf{i} + 2\mathbf{j} - 4\mathbf{k}$

D. $4\mathbf{i} + 2\mathbf{j} + 4\mathbf{k}$

E. $3\mathbf{i} - 2\mathbf{j} + 6\mathbf{k}$

8. The length of the curve

$$x = 1 - 2t^2,\ y = 4t,\ z = 3 + 2t^2,\ 0 \le t \le 2$$

is given by which integral

A. $\int_0^2 16\sqrt{t^2 + 2}\, dt$

B. $\int_0^2 \sqrt{8t^4 + 4t^2}\, dt$

C. $\int_0^2 \sqrt{8t + 4}\, dt$

D. $\int_0^2 4\sqrt{2t^2 + 1}\, dt$

E. $\int_0^2 4\, dt$

9. The curvature of the curve $\mathbf{r}(t) = t\mathbf{i} + te^t\mathbf{j}$ at $t = 0$ is

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}$

C. $\frac{1}{2}$

D. 0

E. $\frac{1}{2\sqrt{2}}$

10. The level curves of $f(x,y) = x - \frac{y}{x}$ are

A. ellipses

B. lines

C. circles

D. parabolas

E. hyperbolas

11. Let $f(x,y) = \frac{x^2y}{x^2+y^2}$, $(x,y) \neq (0,0)$.
Which value of $f(0,0)$ makes f continuous at $(0,0)$.

A. 1

B. 0

C. 2

D. -1

E. no value

12. If $f(x,y) = \ln\sqrt{x^2+y^2}$, find $f_x(1,2)$.

A. $\frac{1}{10}$

B. $\frac{2}{5}$

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

D. $\frac{1}{\sqrt{5}}$

E. $\frac{2}{\sqrt{5}}$

13. Which of the following points belongs to the tangent plane to $z = \ln(x+y)$ at $(2,-1,0)$.

A. $(1,1,1)$

B. $(2,1,3)$

C. $(2,0,2)$

D. $(0,1,-1)$

E. $(3,-2,1)$

14. Find a vector function $\mathbf{s}(t)$ whose graph is the tangent line to

$\mathbf{r}(t) = \langle t^2, \ln t, t\rangle$

at the point $(1,0,1)$. $\mathbf{s}(t) =$

A. $\langle 1+2t, 1+t, 1+t\rangle$

B. $\langle 2t, t, t\rangle$

C. $\langle 1+t, 1+2t, 1+t\rangle$

D. $\langle t, 1+2t, t\rangle$

E. $\langle 1+2t, t, 1+t\rangle$

15. If g and f are differentiable functions of two variables and

$$g(s,t) = f(s - t^2, s - t^2),$$

then $\dfrac{t g_s(s,t)}{g_t(s,t)}$ equals

A. 0

B. $-\dfrac{1}{2}$

C. -1

D. st

E. 1

16. Let $z = 2u^2 + v - w^2$, $u = \dfrac{x}{2}\cos y$, $v = x \sin y$, and $w = f(x,y)$. When $x = 1$, $y = \pi$ it is known that $w = 2$, $\dfrac{\partial w}{\partial x} = -1$, and $\dfrac{\partial w}{\partial y} = 1$. Find $\dfrac{\partial z}{\partial x}$ when $x = 1$, $y = \pi$.

A. 5

B. $\dfrac{7}{5}$

C. -5

D. $\dfrac{9}{2}$

E. -3