MAC2313 Test 1 A

(5 pts) 1. Let $\mathbf{u} = \langle -3, 4, -1 \rangle$ and $\mathbf{w} = \langle -2, \mathrm{y}, 3 \rangle$; for which value of y are the two vectors orthogonal?

A. $1/4$ B. $-9/4$ C. $9/4$ D. $-1/4$ E. $-3/4$

(5 pts) 2. Let $\mathbf{u} = 2\mathbf{j} - 3\mathbf{k}$ and $\mathbf{w} = \mathbf{i} - \mathbf{k}$; then $\mathbf{u} \times \mathbf{w}$ is given by:

A. $\langle -2, -3, -1 \rangle$ B. $\langle -2, -3, 1 \rangle$ C. $\langle -2, -3, -2 \rangle$ D. $\langle 0, -3, -2 \rangle$ E. none of the above

(5 pts) 3. If $\mathbf{u}, \mathbf{v}$, and $\mathbf{w}$ are vectors in R^3 and c is a scalar, then which of the following is <u>not</u> true:

A. $\mathbf{v} \cdot \mathbf{u} = \mathbf{v} \cdot \mathbf{u}$

B. $(c\mathbf{v}) \cdot \mathbf{u} = \mathrm{c}(\mathbf{v} \cdot \mathbf{u})$

C. $\mathbf{v} \cdot \mathbf{v} = ||\mathbf{v}||$

D. $(\mathbf{u} + \mathbf{v}) \cdot \mathbf{w} = \mathbf{w} \cdot \mathbf{u} + \mathbf{w} \cdot \mathbf{v}$

E. $\mathbf{0} \cdot \mathbf{w} = 0$

(5 pts) 4. The area of a triangle with vertices $(1, 3)$, $(2, 5)$, and $(3, 1)$ is:

A. 3 B. 6 C. 9 D. 10 E. 12

(5 pts) 5. Which of the following is the equation of a plane containing the point $(2, 4, 0)$ and parallel to the plane $\langle x + 3, y - 4, z + 2\rangle \cdot \langle 1, -1, 3\rangle = 0$?

A. $x - y + 3z = -2$ B. $x - y + 3z = 6$ C. $-x + y - 3z = 4$ D. $x - y + 3z = -4$

E. none of the above

(5 pts) 6. If $\mathbf{u}, \mathbf{v}$, and $\mathbf{w}$ are vectors in R^3 and c is a scalar, then which of the following is true:

A. $\mathbf{u} \times \mathbf{v}$ is the area of the parallelogram formed by $\mathbf{u}$ and $\mathbf{v}$

B. $(\mathbf{u} + \mathbf{v}) \times \mathbf{w} = \mathbf{w} \times \mathbf{u} + \mathbf{w} \times \mathbf{v}$

C. $\mathbf{u} \times \mathbf{v} = \mathbf{v} \times \mathbf{u}$

D. if $\mathbf{u} = c\mathbf{v}$, then $\mathbf{u} \times \mathbf{v} = \mathbf{0}$

E. $||\mathbf{0} \times \mathbf{v}|| > 0$

(5 pts) 7. The intersection of the ellipsoid $x^2 + 3y^2 + 5z^2 = 10$ with the plane $z = 1$ is a circle.

A. true B. false

(5 pts) 8. The domain of the function $\mathbf{r}(\mathrm{t}) = \langle \ln(2 - \mathrm{t}), \mathrm{e}^{-2\mathrm{t}}, \mathrm{t}/(\mathrm{t}^2 + 1)\rangle$ is:

A. $(2, \infty)$ B. $(-\infty, 2]$ C. $(-\infty, -2) \cup (2, \infty)$

D. $(-\infty, -1) \cup (-1, 0) \cup (0, 1) \cup (1, 2)$ E. none of the above

(5 pts) 9. Which of the following are true?

I. the plane $-x - 4y + 2z = 3$ is orthogonal to the plane $-2x + y + z = 6$

II. the plane $-12x + 6y - 3z = 2$ is parallel to the plane $-4x + 2y - z = 0$

III. the plane $z = -3$ is parallel to the x, y coordinate plane

IV. the point $(1, 2, 0)$ lies in the plane $x - 3y - 2z = -7$

A. only III B. only I C. only I and II D. only I, II, and III E. I, II, III, and IV

(5 pts) 10. Given $\mathbf{r}'(\mathrm{t}) = \langle 6\mathrm{t}^2, 15\mathrm{e}^{3\mathrm{t}}, 8\cos(2\mathrm{t})\rangle$, which of the following is an antiderivative $\mathbf{r}(\mathrm{t})$ such that $\mathbf{r}(0) = \langle 6, 0, 6\rangle$?

A. $\langle 2t^3 + 6, 5e^{3t} - 5, 4\sin(2t) + 6\rangle$

B. $\langle 3t^2 + 3, 5e^{3t} - 5, 4\sin(2t) + 2\rangle$

C $\langle 3t^2 + 6, 15e^{3t} - 15, 8\sin(2t) - 2\rangle$

D. $\langle 2t^3 + 6, 15e^{3t} - 15, 8\sin(2t) + 6\rangle$

E. $\langle 2t^3 + 6, 5e^{3t} - 5, 4\sin(2t) + 2\rangle$

(5 pts) 11. The length of the curve $\mathbf{r}(\mathrm{t}) = \langle 2\mathrm{t}, \ln \mathrm{t}, \mathrm{t}^2\rangle, \mathrm{t} \in [\mathrm{e}, \mathrm{e}^2]$ is:

A. $e^4 + 2$ B. $2e^4$ C. $e^4 - e^2$ D. $e^4 - e^2 + 2$ E. $e^4 - e^2 + 1$

(5 pts) 12. The curvature of $\mathbf{r}(\mathrm{t}) = \langle 2\cos \mathrm{t}, 5, 2\sin \mathrm{t}\rangle$ is constant for all t.

A. true B. false

(5 pts) 13. Which of the following are true?

I. $\mathbf{B} \cdot \mathbf{N} = 0$

II. $\mathbf{B} \times \mathbf{T} = \mathbf{0}$

III. $\kappa = |d\mathbf{T}/\mathrm{ds}|$

IV. $ds/dt = |\mathbf{r}'(\mathrm{t})|$

A. only I   B. only IV   C. only I and II   D. only I and IV   E. only I, III, and IV

(5 pts) 14. Bonus. Which of the following surfaces have an x, z trace given by $x^2 + z^2 = 9$?

A. $y = x^2 + z^2 + 9$ B. $x^2 + 4y^2 + z^2 = 3^2$ C. $y = x^2 - z^2 - 9$ D. $y = x^2 - z^2 + 9$

E. $3x^2 + y^2 + z^2 = 27$

(5 pts) 15. Bonus. The projection of $\mathbf{i}$ onto $\mathbf{j}$ is given by:

A. $\mathbf{0}$ B. $\mathbf{k}$ C. $-\mathbf{k}$ D. $\mathbf{j}$ E. none of the above

MAC2313 Test 1A

Name: ________________________ UF-ID: __________________ Section: _______________

(7 pts) 1. If $\mathbf{N} = \langle 1/3, 2/3, 2/3 \rangle$, $\mathbf{T} = \left\langle 2/\sqrt{5}, -1/\sqrt{5}, 0 \right\rangle$, and $\mathbf{a} = \langle 4, 3, 4 \rangle$, find a_N and a_T.

(7 pts) 2. Calculate κ at the point $t = 0$ for the curve generated by $\mathbf{r}(\mathrm{t}) = \langle 3, \mathrm{t}^2, 4\mathrm{t} \rangle$

(7 pts) 3. For the curve generated by $\mathbf{r}(\mathrm{t}) = \langle \cos 2\mathrm{t}, 3\mathrm{t}, \sin 2\mathrm{t} \rangle$, calculate the principal unit normal vector.

(7 pts) 4. Evaluate $\int_1^3 (2t+3)\mathbf{i} + (3/\mathrm{t})\mathbf{j} + (\mathrm{e}^{2\mathrm{t}-6})\mathbf{k}\ \mathrm{dt}$.

(7 pts) 5. Calculate the angle between the planes $2x - 4y = 5$ and $3y + z = 2$.