

Answer Key 1

Calculus III

Name: _____

Exam I September 26, 2006

Section: _____

number right times 5 = _____

13.

14.

15.

You start with: 10 points

Total Score _____

1. b c d e

7. b c d e

2. b c d e

8. b c d e

3. b c d e

9. b c d e

4. b c d e

10. b c d e

5. b c d e

11. b c d e

6. b c d e

12. b c d e

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1. a b c d e7. a b c d e2. a b c d e8. a b c d e3. a b c d e9. a b c d e4. a b c d e10. a b c d e5. a b c d e11. a b c d e6. a b c d e12. a b c d e

1. The equation of the sphere with center $(4, -1, 3)$ radius $\sqrt{5}$ is

- (a) $(x - 4)^2 + (y + 1)^2 + (z - 3)^2 = 5$ (b) $(x - 4)^2 + (y + 1)^2 + (z - 3)^2 = 25$
(c) $(x - 4)^2 + (y + 1)^2 + (z - 3)^2 = \sqrt{5}$ (d) $(x - 4)^2 + (y - 1)^2 + (z - 3)^2 = 5$
(e) $(x + 4)^2 + (y - 1)^2 + (z + 3)^2 = 5$

2. Find a vector that has the same direction as the vector $\langle 1, 4, 8 \rangle$, but has length 18.

- (a) $2\langle 1, 4, 8 \rangle$ (b) $18\langle 1, 4, 8 \rangle$ (c) $9\langle 1, 4, 8 \rangle$ (d) $\frac{1}{9}\langle 1, 4, 8 \rangle$ (e) $\langle 1, 4, 8 \rangle$

3. If \mathbf{v} lies in the first quadrant and makes an angle $\frac{\pi}{6}$ with the positive x -axis and $|\mathbf{v}| = 6$.
Find \mathbf{v} .

- (a) $\langle 3\sqrt{3}, 3 \rangle$ (b) $\langle 3, 3\sqrt{3} \rangle$ (c) $\langle 6, 2 \rangle$ (d) $\langle -3\sqrt{3}, 3 \rangle$ (e) $\langle 3\sqrt{2}, 3 \rangle$

4. Find the volume of the parallelepiped determined by the vectors $\langle 1, 2, 7 \rangle$, $\langle 0, -3, 4 \rangle$ and $\langle 0, 0, 6 \rangle$.

- (a) 18 (b) 12 (c) -18 (d) 16 (e) 0

5. Find an equation for the line through the point $(3, -1, 2)$ and perpendicular to the plane $2x - y + z + 10 = 0$.

- (a) $\frac{x-3}{2} = \frac{y+1}{-1} = z-2$ (b) $3x - y + 2z + 10 = 0$
(c) $\frac{x+3}{2} = \frac{y-1}{-1} = z+2$ (d) $\frac{x-2}{3} = \frac{y+1}{-1} = \frac{z-2}{2}$
(e) $3x - y + 2z + 10 = 0$

6. Find an equation of the plane that passes through the point $(1, 2, 3)$ and parallel to $x - y + z = 100$

- (a) $x - y + z - 2 = 0$ (b) $x - y + z + 2 = 0$ (c) $x + 2y + 3z = 100$
(d) $x - 1 = 2 - y = z - 3$ (e) $x - 1 = \frac{y+1}{2} = \frac{z-1}{3}$

7. Find the distance between the point $(-1, -1, -1)$ and the plane $x + 2y + 2z - 1 = 0$.

- (a) 2 (b) -2 (c) -6 (d) 6 (e) 0

8. Find the length of the curve $\mathbf{r}(t) = \langle 4 \cos t, -3t, 4 \sin t \rangle$ for $0 \leq t \leq 5$.

- (a) 25 (b) 5 (c) 15 (d) 20 (e) -25

9. Using implicit differentiation to find $\frac{\partial z}{\partial x}$, where $z = f(x, y)$ is implicitly defined by the equation $x^4 + y^4 + z^4 = xyz$.

(a) $\frac{4x^3 - yz}{xy - 4z^3}$

(b) $\frac{4x^3 + 4y^3 - yz}{xy - 4z^3}$

(c) $\frac{x^4 + y^4}{xy - z^3}$

(d) $\frac{4x^3}{xy - 4z^3}$

(e) 0

10. Let $z = x^2 + xy + y^2$, $x = s + t$ and $y = s - t$. Find $\frac{\partial z}{\partial s}$

(a) $6s$

(b) $2s$

(c) $3s$

(d) $6t$

(e) 0

11. Let $\mathbf{a} = \langle 2, 1, 2 \rangle$ and $\mathbf{b} = \langle -2, -1, -2 \rangle$. Find $\text{proj}_{\mathbf{a}} \mathbf{b}$, the vector projection of \mathbf{b} onto \mathbf{a} .

(a) $\langle -2, -1, -2 \rangle$

(b) $\langle 6, 3, 6 \rangle$

(c) $\langle 2, 1, 2 \rangle$

(d) $\frac{1}{3}\langle 2, 1, 2 \rangle$

(e) $\langle -6, -3, -6 \rangle$

12. Find what value of b are the vectors $\langle -11, b, 2 \rangle$ and $\langle b, b^2, b \rangle$ orthogonal

(a) $0, 3, -3$

(b) $0, 2, -2$

(c) $0, -11, 2$

(d) $0, 11, 3$

(e) $0, 11, 2$

13. (a) Find the velocity vector of a particle that has the given acceleration $\mathbf{a}(t) = \langle 6t, e^t, \cos t \rangle$ and the given initial velocity $\mathbf{v}(0) = \langle 0, 1, 0 \rangle$.

(b) If the initial position $\mathbf{r}(0) = \langle 0, 1, -1 \rangle$, then find the position vector $\mathbf{r}(t) = ?$

14. Find the limit, if it exists, or show that the limit does not exist where

$$\lim_{(x,y) \rightarrow (0,0)} \frac{y^2}{2x^2 + \sin(y^2)}$$

15. Find the tangent component a_T and normal component $|a_N|$ of the acceleration vector of

$$\mathbf{r}(t) = \langle e^t, e^{-t}, \sqrt{2}t \rangle.$$

(Hint: To simplify your calculation, you might consider to use $e^{2t} + 2 + e^{-2t} = (e^t + e^{-t})^2$ and $\frac{e^{2t} - e^{-2t}}{e^t + e^{-t}} = e^t - e^{-t}$).