Multiple Choice Practice

Math 2400-004, Calculus III, Fall 2019

Name:

1. Find the angle between the vectors $\langle 1, 2, 3\rangle$ and $\langle -5, 0, 2\rangle$

   (a) $\arccos(\frac{11}{20})$
   (b) $\frac{\pi}{3}$
   (c) $\arccos(\frac{1}{\sqrt{406}})$
   (d) $\frac{\pi}{6}$

2. Calculate the area of the triangle with vertices $(1, -1, 0)$, $(2, 2, 2)$ and $(-3, 1, 1)$

   (a) 4
   (b) $\frac{\sqrt{278}}{2}$
   (c) 2
   (d) $\sqrt{278}$

3. Find the distance between the center of the sphere $x^2 + 4x + z^2 = 2y - y^2$ and the point $(2, -1, 0)$

   (a) $2\sqrt{10}$
   (b) $2\sqrt{5}$
   (c) $\sqrt{5}$
   (d) $\sqrt{10}$

4. Which vector could lie on the same plane as $\langle 1, -1, 3\rangle$ and $\langle -5, 0, 10\rangle$?

   (a) $\langle 10, 0, 0\rangle$
   (b) $\langle 1, 0, 2\rangle$
   (c) $\langle 0, 0, 10\rangle$
   (d) $\langle 1, 0, -2\rangle$

5. Find the line of intersection of the planes $x + y + z = 5$ and $2y - x - z = -1$

   (a) $\langle \frac{11}{3} - t, \frac{4}{3}, t\rangle$
   (b) $\langle t - \frac{11}{3}, \frac{4}{3}, t\rangle$
   (c) $\langle t, \frac{4}{3}t, 5 - 3t\rangle$
   (d) $\langle -t, 2t, t + \frac{4}{3}\rangle$

6. Find the equation of the plane containing the points $(1,-1,2)$, $(4,4,0)$ and $(-3,1,1)$.

   (a) $(x-4) - 11(y-4) - 26z = 0$
   (b) $(x+3) + 11(y-1) - 26(z-1) = 0$
   (c) $(x-4) - 11(y-4) = 0$
   (d) $(x+1) + 11(y-1) - 26(z-2) = 0$

7. Find the distance between the line $\frac{x-1}{2} = \frac{y}{3} = \frac{z+2}{1}$ and the point $(1,3,2)$

   (a) 0
   (b) $\sqrt{13}$
   (c) $\sqrt{25 - \frac{169}{14}}$
   (d) $\sqrt{2 - \frac{1}{14}}$

8. Identify the surface $x - y^2 = z^2$.

   (a) Cone
   (b) Hyperbolic Paraboloid
   (c) Elliptic Paraboloid
   (d) Ellipsoid

9. Identify the surface $z^2 + y^2 - x^2 = -4$.

   (a) Hyperbolic Paraboloid
   (b) Hyperboloid of Two-Sheets
   (c) Hyperboloid of One-Sheet
   (d) Cone

10. Convert the point $(1,-1,2)$ from rectangular coordinates into cylindrical coordinates.

   (a) $(\sqrt{2}, \frac{7\pi}{4}, 2)$
   (b) $(1, \frac{7\pi}{4}, 2)$
   (c) $(\sqrt{2}, \frac{\pi}{4}, 2)$
   (d) $(1, \frac{\pi}{4}, 2)$

11. Convert the point $(2, \pi, \frac{\pi}{4})$ from spherical coordinates into rectangular coordinates.

   (a) $(0, -\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$
   (b) $(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, 0)$
   (c) $(-\frac{\sqrt{2}}{2}, 0, \frac{\sqrt{2}}{2})$
   (d) $(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, 0)$

12. Calculate $\lim_{x\to 0} \left\langle \dfrac{x}{x+1}, e^x, \dfrac{x-1}{x^2-1} \right\rangle$.

(a) 2
(b) $\langle 1, 1, 0 \rangle$
(c) $\langle 0, 1, 1 \rangle$
(d) Undefined

13. Let $\mathbf{s}(t) = \langle \ln(t^2), \cos(t), \tan(t) \rangle$. Find $\mathbf{s}'(t)$.

(a) $\langle \frac{2}{t}, \sin(t), \frac{1}{1+t^2} \rangle$
(b) $\langle \frac{2t}{t^2}, -\sin(t), \sec^2(t) \rangle$
(c) $\frac{2t}{t^2} - \sin(t) + \frac{1}{1+t^2}$
(d) $\frac{2}{t} - \sin(t) + \sec^2(t)$

14. Let $\mathbf{s}(t) = \langle \frac{1}{1+t^2}, e^t, \sin(\pi t) \rangle$. Find $\int_0^1 \mathbf{s}(t)\, dt$.

(a) $\langle \frac{\pi}{4}, e-1, \frac{2}{\pi} \rangle$
(b) $\langle \frac{\pi}{2}, e, 0 \rangle$
(c) $\langle 1, e, \frac{1}{\pi} \rangle$
(d) $\langle \frac{\pi}{2}, e-1, 0 \rangle$

15. Which of the following is a parametrization for the cylinder $y^2 + z^2 = 4$ from $x = 0$ to $x = 5$?

(a) $\langle x, r\cos(t), r\sin(t) \rangle$ with $0 \le x \le 5$, $0 \le r \le 2$, and $0 \le t \le 2\pi$
(b) $\langle x, y, \sqrt{4-y^2} \rangle$ with $0 \le x \le 5$ and $-2 \le y \le 2$
(c) Neither A nor B
(d) Both A and B

16. Which of the following is the parametrization for the plane $x - y + 4z = 4$ within the cylinder $x^2 + z^2 = 1$

(a) $\langle x, y, 1 + \frac{y}{4} - \frac{x}{4} \rangle$ with $x^2 + y^2 \le 4$
(b) $\langle \cos(t), 4 - \cos(t) - 4\sin(t), \sin(t) \rangle$ with $0 \le t \le 2\pi$
(c) Neither A nor B
(d) Both A and B

17. Determine the domain of $f(x, y) = \frac{\ln(x)}{\sqrt{4-y^2}}$

(a) $x > 0$ and $-2 \le y \le 2$
(b) $x \ne 0$ and $-2 < y < 2$
(c) $|x| > 0$ and $-2 \le y \le 2$
(d) $x > 0$ and $-2 < y < 2$

18. Find $\frac{\partial f}{\partial x}$ of $f(x, y, z) = xz - \sin(y)$

(a) 1

(b) $z - \sin(y)$

(c) $1 - \sin(y)$

(d) z

19. Find the tangent plane to $f(x, y) = x^3 - y + 2$ at the point $(2, 4, 6)$.

(a) $12x - y - z = 12$

(b) $12x - y = 12 - z$

(c) $12x + y - z = 6$

(d) $2x + 4y + 6z = 0$

20. Find the tangent plane to the surface that contains the curves $\vec{r_1}(t) = \langle t, t^2, -1\rangle$ and $\vec{r_2}(t) = \langle t^3, 1, t\rangle$ at the point $(-1, 1, -1)$.

None of these are correct. Answer should be

$\boxed{2(x+1) + (y-1) + 6(z+1) = 0}$

(a) $-x + y - z = 0$

(b) $2(x + 1) - (y - 1) + 6(z + 1) = 0$

(c) $2(x + 1) + (y - 1) - 6(z + 1) = 0$

(d) Not enough information

21. A mountain is modeled by the equation $f(x, y) = 4 - 2x^2 - y^2$. What is the steepest direction downhill from the point $(1, 0, 2)$?

(a) $\langle -1, 0\rangle$

(b) $\langle 1, 0\rangle$

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

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

22. Determine the number of critical points for the equation $f(x, y) = 3xy - x^3 + y^2$.

(a) 1

(b) 2

(c) 3

(d) 0

23. Which of the following is not a possible λ-value for $f(x,y,z) = x^3+y^3+z^3$ subject to the constraint $x^2+y^2+z^2 = 1$ using the method of Lagrange multipliers?

(a) $\frac{1}{2}$

(b) $\frac{-3}{2}$

(c) $\frac{3}{2}$

(d) $\frac{3\sqrt{2}}{4}$

24. Let C be the positively-oriented smooth boundary curve of a region D in the xy-plane. If the area of D is 5, then find $\int_C \tilde{\mathbf{F}} \cdot d\tilde{\mathbf{r}}$ where $\tilde{\mathbf{F}}(x,y) = \langle e^x - 4y, \cos(y^2) + 2x - 1\rangle$.

(a) 30

(b) 5

(c) 10

(d) Not enough information

25. Which of the following integrals could represent the surface area of the elliptic paraboloid $y = 4x^2 + 4z^2$ below the plane $y = 4$?

(a) $\displaystyle\int_0^{2\pi}\int_0^1 \sqrt{64r^2+1}\,dr\,d\theta$

(b) $\displaystyle\int_0^{2\pi}\int_0^2 \sqrt{64r^2+1}\,dr\,d\theta$

(c) $\displaystyle\int_0^{2\pi}\int_0^2 r\sqrt{64r^2+1}\,dr\,d\theta$

(d) $\displaystyle\int_0^{2\pi}\int_0^1 r\sqrt{64r^2+1}\,dr\,d\theta$

26. Which of the following integrals could represent the surface area of the cylinder $x^2 + y^2 = 1$ between the planes $z = 0$ and $z = 5$?

(a) $\displaystyle\int_0^{2\pi} 5\,dt$

(b) $\displaystyle\int_0^{2\pi}\int_0^1 dr\,d\theta$

(c) $\displaystyle\int_0^{2\pi} t\,dt$

(d) $\displaystyle\int_0^{2\pi}\int_0^2 r\,dr\,d\theta$