Pages 5 and 6 plus solutions.

19. Find $f(-1, 2)$ for the function $f(x, y) = x^3 + y^2 - 3xy + 5$.
(a) 10
(b) 8
(c) 20
(d) -8
(e) None of these

20. Describe the level curves of $f(x, y) = \sqrt{1 + x^2 - y}$.
(a) The level curves are circles.
(b) The level curves are straight lines passing through the origin.
(c) The level curves are parabolas with vertices on the x-axis.
(d) The level curves are parabolas with vertices on the y-axis.

21. Find $f_y(x, y)$ for $f(x, y) = e^{xy}(\cos x \sin y)$.
(a) $xe^{xy}(\cos x \cos y)$
(b) $e^{xy}(\cos x \cos y)$
(c) $e^{xy}(\cos x)(\cos y + x \sin y)$
(d) $e^{xy}(\cos x)(\cos y + \sin y)$
(e) None of these

22. Find $f_x\left[3, \sqrt{11}, -4\right]$ for $f(x, y, z) = \sqrt{x^2 + y^2 + z^2}$.
(a) $\frac{1}{2}$
(b) $-\frac{1}{9}$
(c) $-\frac{2}{3}$
(d) $\frac{1}{12}$
(e) None of these

23. Use implicit differentiation to find $\frac{\partial z}{\partial x}$ for $xy^2 + xz^2 = 10$.
(a) $\frac{y^2 + z^2}{2xz}$
(b) $\frac{10 - xy^2}{2z}$
(c) $-\frac{(y^2 + z^2)}{2xz}$
(d) $-\frac{(y^2 + z^2)}{z^2}$
(e) None of these

24. The radius of a right circular cylinder is decreasing at the rate of 4 inches per minute and the height is increasing at the rate of 8 inches per minute. What is the rate of change of the volume when $r = 4$ inches and $h = 8$ inches?
(a) 128π in^3/min
(b) 384π in^3/min
(c) -256π in^3/min
(d) -128π in^3/min
(e) None of these

25. Let $f(x, y) = 3x^2 - 3xy - y^2$. Find the maximum value of the directional derivative of f at the point $(1, 1)$.
(a) 4
(b) $\sqrt{10}$
(c) -1
(d) $\sqrt{34}$
(e) None of these

26. Find a unit normal vector to the surface $x + 2y + 3z = 6$ at the point $(3, 0, 1)$.
(a) $\frac{1}{\sqrt{14}}\mathbf{i} + \frac{2}{\sqrt{14}}\mathbf{j} + \frac{3}{\sqrt{14}}\mathbf{k}$
(b) $\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$
(c) $\frac{1}{\sqrt{13}}(\mathbf{i} + 2\mathbf{j} + 3\mathbf{k})$
(d) $\frac{1}{\sqrt{10}}(3\mathbf{i} + \mathbf{k})$
(e) None of these

27. Find an equation of the tangent plane to the surface $2x^2 + 3y^2 + 4z^2 = 18$ at the point $(-1, 2, 1)$.
(a) $-x + 3y + 2z = 7$
(b) $-x + 3y + 2z = 9$
(c) $-4x + 12y + 8z = -36$
(d) $4x + 12y + 8z = 24$
(e) None of these

28. Find a set of symmetric equations for the normal line to the surface $x^2 + y^2 - z^2 = 0$ at the point $(-3, 4, 5)$.
(a) $\frac{x + 3}{-6} = \frac{y - 4}{8} = \frac{z - 5}{-10}$
(b) $\frac{x - 3}{-6} = \frac{y - 4}{8} = \frac{z - 5}{-10}$
(c) $\frac{x + 3}{-6} = \frac{y + 4}{8} = \frac{z - 5}{10}$
(d) $\frac{x + 3}{-6} = \frac{y - 4}{4} = \frac{z - 5}{-5}$
(e) None of these

29. Find a unit vector normal to the surface given by $f(x, y) = x^2 - 3xy + y^2$ at the point where $x = y = 1$.
(a) $\mathbf{i} + \mathbf{j} + \mathbf{k}$
(b) $-\mathbf{i} - \mathbf{j}$
(c) $\frac{1}{\sqrt{3}}\mathbf{i} + \frac{1}{\sqrt{3}}\mathbf{j} + \frac{1}{\sqrt{3}}\mathbf{k}$
(d) $-\frac{1}{\sqrt{2}}\mathbf{i} - \frac{1}{\sqrt{2}}\mathbf{j}$
(e) None of these

30. Use the Second Partials Test to determine the nature of the function $f(x, y)$ at the point $(x_0, y_0, f(x_0, y_0))$ if $f_{xx}(x_0, y_0) = 2$, $f_{yy}(x_0, y_0) = 8$, and $f_{xy}(x_0, y_0) = 4$. Assume $f_x(x_0, y_0) = f_y(x_0, y_0) = 0$.
(a) Relative maximum
(b) Relative minimum
(c) Saddle point
(d) Test is inconclusive

1. c	Chapter:111	QUESTION: 2
2. d	Chapter:111	QUESTION: 9
3. a	Chapter:111	QUESTION: 10
4. e	Chapter:111	QUESTION: 11
5. a	Chapter:111	QUESTION: 12
6. b	Chapter:111	QUESTION: 17
7. b	Chapter:111	QUESTION: 21
8. b	Chapter:112	QUESTION: 2
9. e	Chapter:112	QUESTION: 10
10. b	Chapter:112	QUESTION: 11
11. d	Chapter:113	QUESTION: 4
12. c	Chapter:114	QUESTION: 1
13. b	Chapter:114	QUESTION: 2
14. c	Chapter:114	QUESTION: 12
15. a	Chapter:115	QUESTION: 9
16. d	Chapter:115	QUESTION: 11
17. d	Chapter:115	QUESTION: 18
18. b	Chapter:121	QUESTION: 10
19. e	Chapter:121	QUESTION: 15
20. d	Chapter:121	QUESTION: 17
21. c	Chapter:123	QUESTION: 2
22. c	Chapter:123	QUESTION: 22
23. c	Chapter:125	QUESTION: 5
24. d	Chapter:125	QUESTION: 6
25. d	Chapter:126	QUESTION: 24
26. a	Chapter:127	QUESTION: 4
27. b	Chapter:127	QUESTION: 8
28. a	Chapter:127	QUESTION: 9
29. c	Chapter:127	QUESTION: 17
30. d	Chapter:128	QUESTION: 19