1. If the plane containing the point $(2, 1, 2)$ and the line given by

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

passes through the point $(-1, b, 1)$ then $b =$

(a) -3 (correct)
(b) 3
(c) 2
(d) -2
(e) 1

2. The distance between the planes

$$2x - 3y + 6z = 6 \text{ and } -4x + 6y - 12z = 2$$

is equal to

(a) 1 (correct)
(b) 2
(c) 3
(d) 6
(e) 8

3. The distance between the two lines

$$L_1 : -2x = y - 3 = 2z - 8 \text{ and } L_2 : 2x = 1 - y = 8 - 2z,$$

is equal to

(a) $\frac{\sqrt{12}}{3}$ (correct)

(b) $\frac{\sqrt{22}}{3}$

(c) $\frac{\sqrt{66}}{3}$

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

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

4. The surface

$$4x^2 - 3y^2 + 12z^2 + 12 = 0$$

is

(a) a hyperboloid of two sheets with the y-axis as its axis (correct)

(b) a hyperboloid of two sheets with the x-axis as its axis

(c) a hyperboloid of one sheet with the z-axis as its axis

(d) a hyperboloid of one sheet with the y-axis as its axis

(e) a hyperboloid of one sheet with the x-axis as its axis

5. An equation of the surface that consists of all points equidistant from the point $(2, 2, 2)$ and the xy-plane is

(a) $z = \dfrac{(x-2)^2}{4} + \dfrac{(y-2)^2}{4} + 1$ (correct)

(b) $\dfrac{(z-1)^2}{2} = \dfrac{(x-2)^2}{4} + \dfrac{(y-2)^2}{4}$

(c) $\dfrac{(z-2)^2}{4} = (x-2)^2 + (y-2)^2$

(d) $z = (x-2)^2 + (y-2)^2 + 2$

(e) $y = \dfrac{(x+2)^2}{4} + \dfrac{(z+2)^2}{4} + 2$

6. The level curves of $f(x, y) = e^{1-x^2+y^2}$ are

(a) hyperbolas (correct)

(b) parabolas

(c) ellipses

(d) circles

(e) lines

7. $\lim_{(x,y)\to(0,0)} e^{\left(\frac{1-\sec(x^2+y^2)}{x^2+y^2}\right)} =$

(a) 1 (correct)

(b) e

(c) 0

(d) ∞

(e) $-\infty$

8. $\lim_{(x,y)\to(0,1)} \tan^{-1}\left(\frac{x^2-1}{x^2+(y-1)^2}\right) =$

(a) $-\frac{\pi}{2}$ (correct)

(b) $\frac{\pi}{2}$

(c) 0

(d) DNE

(e) $-\frac{\pi}{4}$

9. Let $f(x, y, z) = ye^x + x \ln z$, then $x f_{xz} f_{zx} + f_{zz} =$

(a) 0 (correct)

(b) $\frac{-x}{z^2}$

(c) 1

(d) $\frac{x}{z^2}$

(e) $\frac{-x}{z}$

10. Let $f(x, y) = x^y$, then $f_y(e, 1) =$

(a) e (correct)

(b) 1

(c) e^2

(d) e^e

(e) 0

11. If the radius and height of a right circular cylinder are respectively measured as $10\,cm$ and $30\,cm$ with possible errors $\pm 0.02\,cm$ and $\pm 0.04\,cm$, respectively, then the error in calculating the volume of the cylinder is approximately

(a) $\pm 16\,\pi\,cm^3$ (correct)

(b) $\pm 18\,\pi\,cm^3$

(c) $\pm 15\,\pi\,cm^3$

(d) $\pm 20\,\pi\,cm^3$

(e) $\pm 12\,\pi\,cm^3$

12. If (x, y) moves from the point $(2, 2)$ to the point $(2.04,\ 1.98)$, then, using differentials, we find that the change in $z = \sqrt{3x^2 + y^2}$ is approximately

(a) 0.05 (correct)

(b) 0.04

(c) 0.03

(d) 0.02

(e) 0.06

13. If $x\cos 3y + x^3y^5 = 3x - e^{xy}$, then the value of $\dfrac{dy}{dx}$ at the point $(1,0)$ is

(a) 2 (correct)
(b) -2
(c) 1
(d) -1
(e) 0

14. Let $w = xy^2 + yz^2 + zx^2$, $x = t^2$, $y = t^2 - 2s$, $z = s^2 - 2t$. The value of $\dfrac{\partial w}{\partial s}$ when $t = 1$, $s = 1$ is equal to

(a) 8 (correct)
(b) 4
(c) 6
(d) 2
(e) 0

15. The directional derivative of $f(x,y) = e^{-(x^2+y^2)}$ at $(0,0)$ in the direction of $\vec{v} =< 1, 1 >$ is

(a) 0 (correct)

(b) 1

(c) 2

(d) -1

(e) -2

16. If the temperature at the point (x,y) on a metal plate is $T(x,y) = \dfrac{x}{x^2+2y^2}$, the direction of the greatest increase in heat from the point $(1,-1)$ is

(a) $\left\langle \frac{1}{9}, \frac{4}{9} \right\rangle$ (correct)

(b) $\left\langle \frac{1}{9}, \frac{-2}{9} \right\rangle$

(c) $\left\langle \frac{2}{9}, \frac{-1}{9} \right\rangle$

(d) $\left\langle \frac{4}{9}, \frac{1}{9} \right\rangle$

(e) $\left\langle \frac{1}{25}, \frac{-4}{25} \right\rangle$

17. If $f(x,y) = x - y^2$, then the tangent line to the level curve $f(x,y) = 3$ at point $(4,-1)$ is

(a) $2y = -x + 2$ (correct)

(b) $7y = -2x + 1$

(c) $y = -x + 3$

(d) $-7y = -x + 11$

(e) $y = x + 1$

18. The domain of the function $f(x,y,z) = \dfrac{\sqrt{x^2+y^2+z^2-64}}{y}$ is

(a) The set of all points lying on or outside the sphere with center at the origin and radius 8 and are not on the xz-plane. (correct)

(b) The set of all points lying on or inside the sphere with center at the origin and radius 8 and are not on the xz-plane.

(c) The set of all points lying on or outside the sphere with center the origin and radius 4 and are not on the x-axis.

(d) The set of all points lying on or inside the sphere with center at the origin and radius 4 and are not on the y-axis.

(e) The set of all points lying on or outside the sphere with center at the origin and radius 8 and are not on the x-axis.

19. Let $f(x,y) = \begin{cases} \dfrac{3x^2y}{x^4+y^2}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$

Which one of the following statements is **FALSE**?

(a) $\lim\limits_{(x,y)\to(0,0)} f(x,y)$ exists _____(correct)

(b) f is not differentiable at $(0,0)$

(c) f is not continuous at $(0,0)$

(d) The domain of f is $\mathbb{R}^2$

(e) $f_x(0,0) = 0$

20. If z is defined implicitly as a differentiable function of x and y by the equation

$$x \ln y + y^2 z - z^2 x = 10$$

then $\dfrac{\partial z}{\partial x} =$

(a) $\dfrac{z^2 - \ln y}{y^2 - 2xz}$ _____(correct)

(b) $\dfrac{z^2 - \ln y}{y^2 + 2xz}$

(c) $\dfrac{z^2 + \ln y}{y^2 + 2xz}$

(d) $\dfrac{z^2 - x}{y^2 - 2xz}$

(e) $\dfrac{y^2 - \ln y}{y^2 - 2xz}$

Math 201, 223, Exam II

Answer KEY

Q	MASTER	CODE01	CODE02	CODE03	CODE04
1	A	C 18	B 3	D 3	C 10
2	A	B 12	E 5	A 1	A 7
3	A	A 19	E 18	D 19	B 19
4	A	A 1	D 13	E 14	B 13
5	A	A 20	D 16	D 10	C 16
6	A	D 17	D 15	A 20	C 6
7	A	B 15	C 8	A 7	C 9
8	A	B 5	E 7	D 13	B 8
9	A	B 11	A 9	D 12	A 15
10	A	C 2	D 2	A 6	E 4
11	A	A 13	C 4	E 8	B 11
12	A	B 16	E 6	D 4	D 2
13	A	E 14	B 19	A 18	B 17
14	A	E 4	A 12	A 16	E 5
15	A	C 3	C 17	A 17	E 12
16	A	E 7	C 1	D 9	A 14
17	A	D 9	E 20	B 2	A 20
18	A	D 8	E 14	D 15	C 1
19	A	D 6	E 10	B 11	D 3
20	A	A 10	E 11	C 5	E 18