MATHS

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THREE DIMENSIONAL GEOMETRY

Practice Exercise

1. The xy-plane divides the line joining the points $(-1, 3, 4)$ and $(2, -5, 6)$.

A. internally in the ratio 2:3

B. externally in the ratio 2:3

C. internally in the ratio 3:2

D. externally in the ratio 3:2

Answer: B

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2. If a line makes angle $\frac{\pi}{3}$ and $\frac{\pi}{4}$ with x-axis and y-axis respectively then the angle made by the line with z-axis, is

A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{4}$

D. $\frac{5\pi}{12}$

Answer: B

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3. If A (3, 2, 0), B (5, 3, 2) and C (-9, 6, -3) are three points forming a triangle and AD is bisector of $\angle BAC$, then AD meets BC at the point

A. $\left(19, 8, \frac{57}{16}, \frac{17}{16}\right)$

B. $\left(-\frac{19}{8}, \frac{57}{16}, \frac{17}{16}\right)$

C. $\left(\frac{19}{8}, \frac{57}{16}, 17, 16\right)$

D. none of these

Answer: A

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4. In ΔABC the mid points of the sides AB, BC and CA are $(l, 0, 0), (0, m, 0)$ and $(0, 0, n)$ respectively. Then, $\frac{AB^2 + BC^2 + CA^2}{l^2 + m^2 + n^2}$ is equal to

A. 2

B. 4

C. 8

D. 16

Answer: C

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5. If $P(x, y, z)$ is a point on the line segment joining $Q(2, 2, 4)$ and $R(3, 5, 6)$ such that the projection of $\overrightarrow{OP}$ on the axes are $\frac{13}{5}, \frac{19}{5}, \frac{26}{5}$ respectively, then P divides QR in the ratio:

A. $1:2$

B. $3:2$

C. $2:3$

D. $1:3$

Answer: B

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6. The projections of a directed line segment on the coordinate axes are 12,4,3. The direction cosines of the line are

A. $\frac{12}{13}, -\frac{4}{13}, \frac{3}{13}$

B. $-\frac{12}{13}, -\frac{4}{13}, \frac{3}{13}$

C. $\frac{12}{13}, \frac{4}{13}, \frac{3}{13}$

D. none of these

Answer: C

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7. If the line $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then k is equal to

A. $\frac{9}{2}$

B. 10

C. 1

D. $\frac{12}{11}$

Answer: A

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8. The foot of perpendicular from (0,2,3) to the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$ is

A. $(-2,3,4)$

B. $(2,-1,3)$

C. $(2,3,-1)$

D. $(3,2,-1)$

Answer: C

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9. Perpenficular distance of the point (1, 2, 3) from the line $\frac{x-6}{3}=\frac{y-7}{2}=\frac{z-7}{-2}$ is

A. 7

B. 5

C. 8

D. 0

Answer: A

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10. Find the length of the perpendicular drawn from point $(2, 3, 4)$ to line $\frac{4-x}{2} = \frac{y}{6} = \frac{1-z}{3}$.

A. $\frac{3}{7}\sqrt{101}$

B. $\frac{2}{7}\sqrt{101}$

C. $\frac{2}{7}\sqrt{103}$

D. $\frac{3}{7}\sqrt{103}$

Answer: A

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11. Find the angle between the lines $\frac{x-2}{3}=\frac{y+1}{-2}=z=2and\frac{x-1}{1}=\frac{2y+3}{3}=\frac{z+5}{2}$.

A. $\pi/2$

B. $\pi/3$

C. $\pi/6$

D. none of these

Answer: A

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12. The angle between the diagonal of a cube and an edge of the cube intersecting the diagonal, is

A. $\cos^{-1}\left(\frac{1}{3}\right)$

B. $\cos^{-1}\left(\sqrt{\frac{2}{3}}\right)$

C. $\tan^{-1}\left(\sqrt{2}\right)$

D. none of these

Answer: C

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13. The angle between the lines whose direction cosines are given by $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$ is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: C

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14. The angle between the lines whose direction cosines (l,m, n) satisfy the equations l + m + n = 0 and 2lm + 2ln - mn = 0, is

A. 60°

B. 90°

C. 110°

D. 120°

Answer: D

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15. Find the shortest distance between the lines $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ and $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$

A. $\sqrt{29}$ units

B. 29 units

C. $\frac{29}{2}$ units

D. $2\sqrt{29}$ units

Answer: D

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16. If a plane meets the coordinate axes in A, B, C and (α, β, γ) is the centroid of $\triangle$ ABC. Then, the equation of the plane is

A. $\frac{x}{3\alpha} + \frac{y}{3\beta} + \frac{z}{3\gamma} = 1$

B. $\frac{3x}{\alpha} + \frac{3y}{\beta} + \frac{3z}{\gamma} = 1$

C. $\alpha x + \beta y + \gamma z = 1$

D. none of these

Answer: A

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17. If the plane $\frac{x}{2}+\frac{y}{3}+\frac{z}{6}=1$ cuts the coordinates axes at points A,B and C. Then, find the area of $\triangle$ ABC.

A. $\sqrt{18}$ sq units

B. 30 sq units

C. $3\sqrt{14}$ sq units

D. $13\sqrt{14}$ sq units

Answer: C

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18. Prove that the distance of the points of intersection of the line $\frac{x-2}{3}=\frac{y+1}{4}=\frac{z-2}{12}$ and the plane

$x - y + z = 5$ from the point $(- 1, \ - 5. \ - 10)$ is 13.

A. 10

B. 11

C. 12

D. 13

Answer: D

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19. The intercepts made on the axes by the plane the which bisects the line joining the points $(1, 2, 3)$ and

$(-3, 4, 5)$ at right angles are a. $\left(-\frac{9}{2}, 9, 9\right)$ b. $\left(\frac{9}{2}, 9, 9\right)$ c. $\left(9, -\frac{9}{2}, 9\right)$ d. $\left(9, \frac{9}{2}, 9,\right)$

A. $\left(-\frac{9}{2}, 9, 9\right)$

B. $\left(\frac{9}{2}, -9, 9\right)$

C. $\left(19, -\frac{9}{2}, 9\right)$

D. $\left(9, \frac{9}{2}, 19\right)$

Answer: A

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20. A line with positive direction cosines passes through the point P (2, - 1,2) and makes equal angles with the

coordinate axes. The line meet the plane 2x + y + z = 9 at point Q. The length of the line segment PQ equals

A. $\sqrt{5}$

B. $3\sqrt{2}$

C. $\sqrt{3}$

D. $\sqrt{7}$

Answer: C

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21. The projection of the line $\frac{x+1}{-1} = \frac{y}{2} = \frac{z-1}{3}$ on the plane $x - 2y + z = 6$ is the line of intersection of

this plane with the plane a. $2x + y + 2 = 0$ b. $3x + y - z = 2$ c. $2x - 3y + 8z = 3$ d. none of these

A. $2x + y + 2 = 0$

B. $3x + y + z = 20$

C. $2x + 3y + 8z = 13$

D. $6x - y - 2z = 12$

Answer: A

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22. The equation of the plane containing the line $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ and the point (0,7, - 7), is

A. $x + y + z = 1$

B. $x + y + z = 2$

C. $x + y + z = 0$

D. none of these

Answer: C

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23. The equation of the plane through (3,1,-3) and (1,-2,2) are parallel to the line with direction ratios 1,1,-2 is

A. $x - y + z + 1 = 0$

B. $x + y - z + 1 = 0$

C. $x - y - z - 1 = 0$

D. $x + y + z - 1 = 0$

Answer: D

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24. The equation of the plane through the line of intersection of the planes x + y + z - 1 = 0 and 2x + y - 3z + 2 = 0 passing through the point (1,1,1), is

A. $x - 4z + 3 = 0$

B. $x - y + z = 1$

C. $x + y + z = 3$

D. $2x - y + z = 2$

Answer: A

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25. Find the coordinates of the point where the line through $(3, -4, -5)$ and (2-3,1) crosses the plane passing through the points (2,2,1),(3,0,1) and (4,-1,0).

A. $(1, 2, 7)$

B. $(-1, 2, -7)$

C. $(1, -2, 7)$

D. none of these

Answer: C

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26. The plane passing through the point (-2, - 2, 2) and containing the line joining the points (1, -1,2) and (1,1,1) makes intercepts on the coordinate axes and the sum of whose length is

A. 3

B. 6

C. 12

D. 20

Answer: C

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27. The equation of the plane passing through (2,1,5) and parallel to the plane 3x-4y+5z=4 is

A. $3x - 4y + 5z - 27 = 0$

B. $3x - 4y + 5z + 21 = 0$

C. $3x - 4y + 5z + 26 = 0$

D. $3x - 4y + 5z + 17 = 0$

Answer: A

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28. The equation of the line passing through the point (3, 0, 1) and parallel to the planes x + 2y = 0 and 3y - z = 0, is

A. $\frac{x-3}{-2}=\frac{y-0}{1}=\frac{z-1}{(3)}$

B. $\frac{x-3}{1}=\frac{y-0}{-2}=\frac{z-1}{3}$

C. $\frac{x-3}{3}=\frac{y-0}{1}=\frac{z-1}{-2}$

D. none of these

Answer: A

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29. The equation of the plane which contains two parallel lines $\frac{x+_1}{3} = \frac{y-2}{2} = \frac{z}{1}$ and $\frac{x-3}{3} = \frac{y+4}{2} = \frac{z-1}{1}$ is

A. $3x + 2y + z = 10$

B. $8x + y - 26z + 6 = 0$

C. $4x + 6y + z = 50$

D. none of these

Answer: B

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30. If the planes $x - cy - bz = 0, cx = y + az = 0 and bx + ay - z = 0$ pass through a straight line, then find the value of $a^2 + b^2 + c^2 + 2abc$

A. 2

B. 3

C. 0

D. 1

Answer: D

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31. The equation of plane through the intersection of the planes x + 2y + 3z - 4 = 0 and 2x + y - z + 5 = 0 and perpendicular to the plane 5x + 3y + 6z = 8, is

A. $51x + 15y - 50z - 173 = 0$

B. $51x - 15y + 50z + 173 = 0$

C. $51x + 15y - 50z + 173 = 0$

D. $51x - 15y - 50z - 173 = 0$

Answer: C

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32. The equation of a line $4x - 4y - z + 11 = 0 = x + 2y - z - 1$ can be put as $\frac{x}{2} = \frac{y-2}{1} = \frac{z-3}{4}$ (b) $\frac{x-2}{2} = \frac{y-2}{1} = \frac{z}{4}$ $\frac{x-2}{2} = \frac{y}{1} = \frac{z-3}{4}$ (d) None of these

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

B. $\frac{x-4}{2} = \frac{y-4}{1} = \frac{z-11}{5}$

C. $\frac{x-2}{-2} = \frac{y}{3} = \frac{z+3}{5}$

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

Answer: A

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33. Let the line $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$ lies in the plane $x+3y-\alpha z+\beta=0$. Then, (α, β) equals

A. $(6, -17)$

B. $(-6, 7)$

C. $(5, -15)$

D. $(-5, 15)$

Answer: B

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34. The distance of the plane $x+2y-z=2$ from the point $(2, -1, 3)$, measured in the direction with the

direction ratios (2, 2,1) is

A. 2

B. -3

C. -2

D. 3

Answer: D

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35. A plane is such that the foot of perpendicular drawn from the origin to it is (2, - 1,1). The distance of (1,2,3) from the plane, is

A. $3/2$

B. $\sqrt{3/2}$

C. 2

D. 0

Answer: B

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36. Find the distance of the point(1, 0, -3) from the plane $x - y - z = 9$ measured parallel to the line, $\frac{x-2}{2} = \frac{y+2}{3} = \frac{z-6}{-6}$.

A. 6

B. 7

C. 17

D. 26

Answer: B

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37. Find the equation of the plane through the intersection of the planes $x + 3y + 6 = 0$ and $3x - y - 4z = 0$, whose perpendicular distance from the origin is unity.

A. $x + y - 2z + 3 = 0, x - 2y - 2z - 3 = 0$

B. $2x + y - 2z + 3 = 0, x - 2y - 2z - 3 = 0$

C. $x - y + 2z + 3 = 0, x + 2y + 2z + 3 = 0$

D. $2x - y + 2z - 3 = 0, x + 2y + 2z + 3 = 0$

Answer: B

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38. A plane L passes through the point (-1, - 2, - 1) and normal to it is perpendicular to the lines $\frac{x+1}{3} = \frac{y+2}{1} = \frac{z+1}{2}$ and $\frac{x-2}{1} = \frac{y+2}{2} = \frac{z-3}{3}$ The distance of the point (1, 1, 1) from the plane L is

A. $\frac{12}{\sqrt{75}}$

B. $\frac{17}{\sqrt{75}}$

C. $\frac{13}{\sqrt{75}}$

D. $\frac{20}{\sqrt{75}}$

Answer: C

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39. A plane passes through the point (1,-2,3) and is parallel to the plane $2x - 2y + z = 0$. The distance of the point (-1,2,0) from the plane, is

A. 2

B. 3

C. 4

D. 5

Answer: D

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40. Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is

A. $\frac{3}{2}$

B. $\frac{5}{2}$

C. $\frac{7}{2}$

D. $\frac{9}{2}$

Answer: C

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41. If the lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar, then k can have

A. any value

B. exactly one value

C. exactly two values

D. `exactly three values

Answer: C

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42. Find the coordinates of the foot of the perpendicular drawn from the origin to the plane $2x \quad 3y + 4z \quad 6 = 0$.

A. $\left(\frac{12}{29}, -\frac{18}{29}, \frac{24}{29}\right)$

B. $\left(\frac{13}{19}, -\frac{18}{29}, \frac{24}{29}\right)$

C. $\left(-\frac{12}{29}, \frac{18}{29}, \frac{24}{29}\right)$

D. $\left(\frac{12}{19}, -\frac{18}{29}, -\frac{24}{29}\right)$

Answer: A

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43. Find the image of the point $(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.

A. $(3, 5, -2)$

B. $(-3, 5, 2)$

C. $(3, -5, 2)$

D. $(3, 5, 2)$

Answer: B

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44. Find the image of the point $(1, 6, 3)$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$

A. $(-1, 0, 7)$

B. $(-1, 0, -7)$

C. $(1, 0, 7)$

D. $(2, 0, 7)$

Answer: C

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45. The image of the line $\frac{x-1}{3} = \frac{y-3}{1} = \frac{z-4}{-5}$ in the plane $2x - y + z + 3 = 0$ is the line (1)

$\frac{x+3}{3} = \frac{y-5}{1} = \frac{z-2}{-5}$ (2)

$\frac{x+3}{-3} = \frac{y-5}{-1} = \frac{z+2}{5}$ (3)

$$\frac{x-3}{3}=\frac{y+5}{1}=\frac{z-2}{-5}$$
$$\frac{x-3}{-3}=\frac{y+5}{-1}=\frac{z-2}{5}$$

(3)

A. $\frac{x-3}{-3}=\frac{y+5}{-1}=\frac{z-2}{5}$

B. $\frac{x+3}{3}=\frac{y-5}{1}=\frac{z-2}{-5}$

C. $\frac{x+3}{-3}=\frac{y-5}{-1}=\frac{z+2}{5}$

D. $\frac{x-3}{3}=\frac{y+5}{1}=\frac{z-2}{-5}$

Answer: B

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46. The volume of the tetrahedron formed by coordinate planes and 2x + 3y + z = 6, is

A. 5

B. 4

C. 6

D. 0

Answer: C

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1. Two line whose are $\frac{x-3}{2}=\frac{y-2}{3}=\frac{z-1}{\lambda}$ and $\frac{x-2}{3}=\frac{y-3}{2}=\frac{z-2}{3}$

lie in the same plane, then,

Q. The value of $\sin^{-1}\sin\lambda$ is equal to

A. 3

B. $\pi - 3$

C. 4

D. $\pi - 4$

Answer: D

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2. If the plane $x + y + z = 1$ is rotated through 90° about its line of intersection with the plane $x - 2y + 3z = 0,$ the new position of the plane is

A. $x - 45y + 4z = 1$

B. $x - 5y + 4z = -1$

C. $x - 8y + 7z = 2$

D. $x - 8y + 7z = -2$

Answer: D

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3. The distance of the point (1, - 5,9) from the plane x + y + z = 5 measured along a straight line x = y = z is $2\sqrt{3k}$ then the value of k is

A. 5

B. 6

C. $\sqrt{3}$

D. 4

Answer: A

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4. The angle between the lines whose directionn cosines are given by $2l - m + 2n = 0, lm + mn + nl = 0$ is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: D

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5. Let L be the line of intersection of the planes $2x + 3y + z = 1$ and $x + 3y + 2z = 2$. If L makes an angle α with the positive X=axis, then $\cos \alpha$ equals

A. $1/2$

B. 1

C. $1/\sqrt{2}$

D. $1/\sqrt{3}$

Answer: D

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6. A plane passes through the point (1,-2,3) and is parallel to the plane $2x - 2y + z = 0$. The distance of the point (-1,2,0) from the plane, is

A. 2

B. 3

C. 4

D. 5

Answer: D

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7. The line $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{-1}$ intersects the curve $xy = c^2, z = 0,$ if c is equal to

A. ± 1

B. $\pm 1/3$

C. $\pm \sqrt{5}$

D. none

Answer: C

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8. The direction ratios of the line x-y+z-5=0=x-3y-6` are

A. $3, 1, -2$

B. $2, -4, 1$

C. $\frac{3}{\sqrt{14}}, \frac{1}{\sqrt{14}} \frac{-2}{\sqrt{14}}$

D. $\frac{2}{\sqrt{41}}, \frac{-4}{\sqrt{41}}, \frac{1}{\sqrt{41}}$

Answer: A

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9. The intercepts of the plane $2x - 3y + 4z = 12$ on the coordinate axes are given by

A. $3, -2, 1.5$

B. $6, -4, 3$

C. $6, -4, -3$

D. $2, -3, 4$

Answer: B

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10. The point of intersection of the line $\frac{x-1}{3} = \frac{y+2}{4} = \frac{z-3}{-2}$ and the plane $2x - y + 3z - 1 = 0$, is

A. $(10, -10, 3)$

B. $(10, 10, 13)$

C. $(-10, 10, 3)$

D. none of these

Answer: B

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11. The equation of plane passing through a point A(2, -1, 3) and parallel to the vectors a = (3, 0, -1) and b = (-3, 2, 2) is

A. $2x - 3y + 6z - 25 = 0$

B. $2x - 3y + 6z + 25 = 0$

C. $6x - 2y + 6z - 25 = 0$

D. $3x - 2y + 6z + 25 = 0$

Answer: A

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