ReviewSol (not full solutions)

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Solutions:

1. **(-2 , 3 , 1)**
2. **Answers May Vary**
   - a) **[x , y , z] = [1 , 4 , 2] + t [2 , -1 , 0]**
   - b) **(3 , 3, 2) , (5 , 2 , 2) , (7 ,1 ,2)**
   - c) **x = 1 + 2t and y = 4 – t and z = 2**
   - d) ~~**No symmetric equations**~~ $\frac{x-1}{2} = \frac{y-4}{-1}$, $z=2$
3. **Parts a and b**
4. **Answers may vary [x , y , z] = [1 , 2 , 3] + t [-4 , 5 , 3]**
5. **a) 4x – y + 9z = 0 b) x – 17y + 3z - 1 = 0 c) 3x + y – z – 6 = 0**
6. **8x – y -2z + 29 = 0**
7. **x + 6y + z – 16 = 0**
8. **(-2 , 1 , 5) and 27^0**
9. **b) 2x + y + 2z – 4 = 0 and 2x + y + 2z + 8 = 0**
10. **[x , y z] = [0 , 0 , 0] + t [4 , -7 , -2] ;** $\frac{x}{4} = \frac{y}{-7} = \frac{z}{-2}$
11. **A) y – z – 4 = 0 b) x + 8y – 7z – 25 = 0**
12. **(1 , 2 , -3)**

14. **x = 1 and y = -2**
15. **x = -1 , y = 0 , z = 2**

16. Two vectors that are parallel or collinear with two skew lines are necessarily non-collinear vectors that uniquely determine a plane.

17. a) Answers may vary. One possible answer is (2, 2, 1).

b) $\frac{3}{\sqrt{89}} \doteq 0.318$

c) The magnitude is the distance from the point A to the plane.

18. a) parallel lines

b) skew lines

19. π_1: $3x + 10y - 14z + 19 = 0$

π_2: ~~$7x - 14y + 18z - 11 = 0$~~ $-5x - 14y + 18z - 13 = 0$

20. a) The 3 planes form a triangular prism, that is, one plane intersecting the other 2 forming 3 parallel lines and no common point of intersection.

b) The 3 planes intersect at a point.

c) 2 parallel planes intersected by a 3rd plane forming 2 parallel lines and no common point of intersection

d) 3 distinct planes intersecting in a common line

21. a) (47, 40.25, –14.375)

b) $\left(-\frac{17}{24}, -\frac{25}{8}, \frac{2}{3}\right)$

22. $\pm\frac{1}{\sqrt{3}}[1, -1, 1]$

23. a) $g = 19 - \frac{1}{3}b,\ w = 38 - \frac{2}{3}b$

b) $w = 30, g = 15, b = 12$

24. $2x - 5y + 29 = 0$

25. $\frac{23}{\sqrt{53}} \doteq 3.2$

26. $\left(-\frac{5}{3}, \frac{5}{6}, \frac{5}{6}\right)$

27. $y = k$, where k is a constant.

28. **a)** $(-1, 3, -2)$

b) The intersection is the given line.

29. a) $69.5°$ $\quad 0°$ $\quad 90°$

b) $\pi_1 // \pi_3$ and $\pi_1 \perp \pi_4$.

c) $\pi_1 \cap \pi_2 : (x,y,z) = \left(-\frac{32}{3}, -\frac{22}{3}, 0\right) + t\left(-\frac{11}{3}, -\frac{7}{3}, 1\right) \quad t \in \mathbb{R}$ $\qquad \pi_1 \cap \pi_3 : \varnothing$

$\pi_1 \cap \pi_4 : (x,y,z) = \left(\frac{54}{7}, \frac{13}{7}, 0\right) + t\left(\frac{11}{7}, \frac{2}{7}, 1\right) \quad t \in \mathbb{R}$

d) $\pi_1 // \pi_3$ and distinct, all other pairs are intersecting, with

$\pi_1 \cap \pi_2 : (x,y,z) = \left(-\frac{32}{3}, -\frac{22}{3}, 0\right) + t(11, 7, -3)$, $\pi_1 \cap \pi_4 : (x,y,z) = \left(\frac{54}{7}, \frac{13}{7}, 0\right) + t(11, 2, 7)$,

$\pi_2 \cap \pi_3 : (x,y,z) = \left(\frac{1}{3}, \frac{11}{3}, 0\right) + t(11, 7 - 3)$, $\pi_2 \cap \pi_4 : (x,y,z) = \left(\frac{11}{5}, \frac{83}{15}, 0\right) + t(0, 4, 3)$,

$\pi_3 \cap \pi_4 : (x,y,z) = (3, 5, 0) + t(11, 2, 7)$

e) $\frac{2\sqrt{6}}{3}$ $\quad \frac{5\sqrt{34}}{34}$ $\quad \frac{7\sqrt{6}}{6}$ $\quad \frac{\sqrt{29}}{29}$ $\qquad$ f) $\frac{11\sqrt{6}}{6}$

g) $A \in \pi_2$ $\qquad B \in \pi_1$ and $B \in \pi_2$ $\qquad C$ is not on any of the planes

h) $\left(\frac{19}{6}, \frac{-1}{3}, \frac{-1}{6}\right)$ $\quad \left(\frac{7}{34}, \frac{163}{34}, \frac{16}{17}\right)$ $\quad \left(\frac{4}{3}, \frac{10}{3}, \frac{5}{3}\right)$ $\quad \left(\frac{59}{29}, \frac{161}{29}, \frac{-2}{29}\right)$

i) $x - 1 = \frac{2-y}{2} = -z - 3$ $\quad \frac{1-x}{3} = \frac{y-2}{3} = \frac{-z-3}{4}$ $\quad x - 1 = \frac{2-y}{2} - z - 3$ $\quad \frac{x-1}{2} = \frac{y-2}{3} = \frac{-z-3}{4}$

30. a) $P(2, -1, 3)$ $\qquad$ b) $2\sqrt{35}$ $\qquad$ c) $\dfrac{x-8}{6} = \dfrac{y-9}{10} = \dfrac{z+1}{2}$