MCV4U Equations of Lines and Planes: Chapter 8 Practice Test

Note:
*Tomorrow's test will be rather similar to this practice, and yet it will be different. You may think it would be **normal** to be **cross** with me for being so vague. However, I **do**n'**t** agree. I do hope that this test will provide you with a good **direction** for your studying. Perhaps you may even find two directions...*

1. Determine which line is parallel to the line with Cartesian equation $2x + 3y + 5 = 0$.
   a. $\vec{r} = (-1,-1) + s(2,3),\ s \in \mathbf{R}$
   b. $x = 3t - 1,\ y = -2t - 1,\ t \in \mathbf{R}$
   c. $x = 2t - 1,\ y = 3t - 1,\ t \in \mathbf{R}$
   d. none of the above
2. Which of the following determines a plane?
   a. a line and a point not on the line
   b. two intersecting lines
   c. two parallel, non-coincident lines
   d. all of the above
3. Which of the following is not a plane?
   a. $\vec{r} = (1,3,4) + s(2,-1,2) + t(1,1,1),\ s,t \in \mathbf{R}$
   b. $\vec{r} = (2,4,2) + s(1,-2,3) + t(3,2,2),\ s,t \in \mathbf{R}$
   c. $\vec{r} = (3,2,3) + s(4,-4,2) + t(-2,2,-1),\ s,t \in \mathbf{R}$
   d. $\vec{r} = (-2,1,4) + s(2,2,-1) + t(2,2,1),\ s,t \in \mathbf{R}$
4. Which of the following lines is not parallel to the other three?
   a. $\dfrac{x-3}{2} = \dfrac{y+3}{-6} = \dfrac{z+7}{4}$
   b. $\dfrac{x+1}{-1} = \dfrac{y-7}{3} = \dfrac{z+11}{-2}$
   c. $x = t - 1,\ y = -3t + 4,\ z = 2t - 11,\ t \in \mathbf{R}$
   d. $\vec{r} = (3,-5,-3) + s(2,-3,1),\ s \in \mathbf{R}$
5. Which plane goes through the origin and is perpendicular to the line $\vec{r} = (2,-2,1) + s(2,3,-4),\ s \in \mathbf{R}$?
   a. $2x - 2y + z = 0$
   b. $2x + 3y - 4z = 0$
   c. $2x + 3y + z - 4 = 0$
   d. none of the above
6. Determine the vector and parametric equations for the line passing through the points $P(-1,-3)$ and $Q(3,5)$.
   a. $\vec{r} = (3,5) + s(1,2),\ s \in \mathbf{R}$
      $x = 2t - 1,\ y = 4t - 3,\ t \in \mathbf{R}$
   b. $\vec{r} = (1,-3) + s(4,8),\ s \in \mathbf{R}$
      $x = 4t - 1,\ y = 8t - 3,\ t \in \mathbf{R}$
   c. $\vec{r} = (1,0) + s(2,4),\ s \in \mathbf{R}$
      $x = t - 1,\ y = 2t - 3,\ t \in \mathbf{R}$
   d. all of the above
7. Which of the following equations determines a line with normal vector $\vec{n} = (4,3)$ going through the point $P(1,-1)$?
   a. $4x + 3y - 1 = 0$
   b. $4x + 3y + 1 = 0$
   c. $3x + 4y - 1 = 0$
   d. $3x + 4y + 1 = 0$

8. What value of k will make the planes π_1: $2x - ky + 3z - 1 = 0$ and π_2: $2kx + 3y - 2z = 4$ perpendicular?
   a. 2
   b. 4
   c. 6
   d. 8
9. Which of the following is a unit normal vector to the plane with Cartesian equation $2x - y + 2z - 5 = 0$?
   a. $\vec{n} = (2,-1,2)$
   b. $\vec{n} = \left(\frac{2}{3},-\frac{1}{3},\frac{2}{3}\right)$
   c. $\vec{n} = \left(\frac{2}{5},-\frac{1}{5},\frac{2}{5}\right)$
   d. $\vec{n} = (-2,1,-2)$
10. Which of the following is a direction vector for the plane with Cartesian equation $3x - 2y - 5z + 3 = 0$?
   a. $\vec{d} = (3,-2,-5)$
   b. $\vec{d} = (1,-1,1)$
   c. $\vec{d} = (-1,1,1)$
   d. $\vec{d} = (3,2,5)$

Written Solutions:

11. Determine the parametric equations for the line perpendicular to $L: \vec{r} = (5,6) + s(1,-5)$, $s \in \mathbf{R}$ containing the point $P(2,4)$.

12. Determine Vector, Parametric and if possible Symmetric equations of the line going through the points $P(-2,0,3)$ and $Q(1,3,7)$.

13. Determine a Vector equation and the Cartesian equation of a plane that contains the points $P(3,-1,-2)$, $Q(2,2,0)$, and $R(-5,2,1)$.

14. Determine the equation of a plane containing the point $P_0(1,-1,0)$ and which is perpendicular to the line given by $\frac{x-1}{2} = \frac{y+3}{-1} = \frac{z-2}{3}$.

15. Determine Parametric and Catersian equations of the plane containing the lines
$l_1: (x,y,z) = (3,-4,1) + s(1,-3,-5), \quad s \in \mathbb{R}, \quad l_2: (7,-1,0) + t(-2,6,10), \quad t \in \mathbb{R}.$