6.3 Equations of Planes Worksheet

This document was composed and formatted by Annie Bernatchez.

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1) Does each point lie on the plane $3x - 5y - 6z = 12$

a) $A(0,\ 0,\ -2)$	b) $B(1,\ 1,\ -2)$

2) Find the x-, y-, and z-intercepts of each plane.

a) $2x - 3y + 6z = 12$	b) $4x - 8z = 16$

3) Write the parametric equations of each plane given its vector equation.

a) $[x,\ y,\ z] = [3,\ -1,\ 2] + t[4,\ -2,\ 3] + s[5,\ 1,\ 0]$	b) $[x,\ y,\ z] = [0,\ 8,\ 7] + t[1,\ 0,\ -3] + s[1,\ -4,\ 7]$

4) Write the vector equation of a plane given its parametric equations.

a) $\pi : \begin{cases} x = 1 - 9t + 4s \\ y = 8 - 7t + s \\ z = -1 - 3t + 2s \end{cases}$	b) $\pi : \begin{cases} x = 4 - t - s \\ y = 3 + 4s \\ z = 2t \end{cases}$

5) Determine the x-, y-, and z-intercepts of the plane $[x,\ y,\ z] = [1,\ -3,\ 2] + t[4,\ -3,\ 5] + s[-1,\ 7,\ 0]$

6) Write a vector equation for each plane:

a) contains the origin; has direction vectors $\vec{a} = [2,\ -1,\ 7]$ and $\vec{b} = [3,\ 5,\ 2]$

b) contains the points $D(1,\ -2,\ 3)$, $E(5,\ -1,\ 8)$, and $F(3,\ 9,\ 2)$

7) Determine the vector equation of the plane that contains the points $A(2,\ -1,\ 4)$, $B(-3,\ 4,\ 5)$, and $C(8,\ -1,\ 6)$.

8) A plane is perpendicular to $[x,\ y,\ z] = [1,\ -10,\ 8] + s[1,\ 2,\ -1]$ and contains the point $P(-1,\ 4,\ -2)$. Determine if the point $A(7,\ 10,\ 16)$ is also on this plane.

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Answer Key

1. a) Yes b) No

2. a) $(6,\ 0,\ 0)$, $(0,\ -4,\ 0)$, $(0,\ 0,\ 2)$ b) $(4,\ 0,\ 0)$, no y-int, $(0,\ 0,\ -2)$

3. a) $\pi : \begin{cases} x = 3 + 4t + 5s \\ y = -1 - 2t + s \\ z = 2 + 3t \end{cases}$ b) $\pi : \begin{cases} x = t + s \\ y = 8 - 4s \\ z = 7 - 3t + 7s \end{cases}$

4. a) $[x,\ y,\ z] = [1,\ 8,\ -1] + t[-9,\ -7,\ -3] + s[4,\ 1,\ 2]$ b) $[x,\ y,\ z] = [4,\ 3,\ 0] + t[-1,\ 0,\ 2] + s[-1,\ 4,\ 0]$

5. x-int: $\left(-\frac{6}{7},\ 0,\ 0\right)$, y-int: $(0,\ -6,\ 0)$, z-int: $\left(0,\ 0,\ \frac{6}{5}\right)$

6. a) $[x,\ y,\ z] = [0,\ 0,\ 0] + t[2,\ -1,\ 7] + s[3,\ 5,\ 2]$ b) $[x,\ y,\ z] = [1,\ -2,\ 3] + t[4,\ 1,\ 5] + s[2,\ 11,\ -1]$

7. $[x,\ y,\ z] = [2,\ -1,\ 4] + t[-5,\ 5,\ 1] + s[6,\ 0,\ 2]$

8. Not on the plane.

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