

Homework Solutions

§ 2.3

#4 (a) $3x + y - 4z = 6$

Solve for x : $x = \frac{1}{3}(6 - y + 4z) = 2 - \frac{1}{3}y + \frac{4}{3}z$

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

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ 0 \end{bmatrix} + y \begin{bmatrix} -\frac{1}{3} \\ 1 \\ 0 \end{bmatrix} + z \begin{bmatrix} \frac{4}{3} \\ 0 \\ 1 \end{bmatrix}$$

(b) Solve for y : $y = 6 - 3x + 4z$

$x = x$
 $y = 6 - 3x + 4z$
 $z = z$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 6 \\ 0 \end{bmatrix} + x \begin{bmatrix} 1 \\ -3 \\ 0 \end{bmatrix} + z \begin{bmatrix} 0 \\ 4 \\ 1 \end{bmatrix}$$

(c) Every position vector must correspond to a point on the plane.
 Each pair of direction vectors must be non-zero and non-parallel
 vectors in the plane (i.e. perpendicular to the normal vector to
 the plane $n = \begin{bmatrix} 3 \\ -1 \\ 4 \end{bmatrix}$).

#5 (a) $\begin{bmatrix} 2 & -1 & 3 & 6 \\ 1 & 0 & -4 & 8 \end{bmatrix} \xrightarrow{r_2 \leftrightarrow r_1} \begin{bmatrix} 1 & 0 & -4 & 8 \\ 2 & -1 & 3 & 6 \end{bmatrix} \xrightarrow{r_2 - 2r_1 \rightarrow r_2} \begin{bmatrix} 1 & 0 & -4 & 8 \\ 0 & -1 & 11 & -10 \end{bmatrix}$

Backsolve: $x_1 - 4x_3 = 8 \implies x_1 = 8 + 4x_3$
 $-x_2 + 11x_3 = -10 \implies x_2 = 10 + 11x_3$

Sol'n: $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 8 \\ 10 \\ 0 \end{bmatrix} + x_3 \begin{bmatrix} 4 \\ 11 \\ 1 \end{bmatrix}$, $P = \begin{bmatrix} 8 \\ 10 \\ 0 \end{bmatrix}$, $V = \begin{bmatrix} 4 \\ 11 \\ 1 \end{bmatrix}$

(b). The normal vector to each plane should be perpendicular
 to the direction vector of the line:

$n_1 = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$

$n_1 \cdot V = 8 - 11 + 3 = 0$

$n_2 = \begin{bmatrix} 1 \\ 0 \\ -4 \end{bmatrix}$

$n_2 \cdot V = 4 + 0 - 4 = 0$

#8(b).

$$\begin{bmatrix} 4 + x_2 + 2x_4 \\ x_2 \\ 3 - 5x_4 \\ x_4 \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \\ 3 \\ 0 \end{bmatrix} + x_2 \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \end{bmatrix} + x_4 \begin{bmatrix} 2 \\ 0 \\ -5 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 4 \\ 0 \\ 3 \\ 0 \end{bmatrix} + \text{Span} \left\{ \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 0 \\ -5 \\ 1 \end{bmatrix} \right\}.$$

Academic Year

Department

Advisor

From: 11/2018 To: 11/2018

1. Contact person: Donna Woods

2. Date started: 11/2018

3. Location: 11/2018

4. Reason for change: 11/2018

5. Does the course change affect the student's or faculty's work or academic interests? 11/2018

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