Math Camp
Chunyu Qu

2020 Summer

# Homework 5

Find the projection of v onto u in each case.

(a) V=[-1 3]', u=[2 1]'; (b) v=[1 2 3], $u = e_3$ ; (c) v=[1 2 3]', $u = [\frac{1}{2}\ \frac{1}{2}\ \frac{1}{\sqrt{2}}]$

Find a vector equation of the line l determined by the points P = ( -1 , 5, 0) and Q = ( 2, 1 , 1 ) .

Solve the system

$$\begin{aligned} w - x - y + 2z &= 1 \\ 2w - 2x - y + 3z &= 3 \\ -w + x - y &= -3 \end{aligned}$$

Solve the system

$$\begin{aligned} x_1 - x_2 + 2x_3 &= 3 \\ x_1 + 2x_2 - x_3 &= -3 \\ 2x_2 - 2x_3 &= 1 \end{aligned}$$

Solve the linear system

$$\begin{aligned} x + y - 2z &= 4 \\ x + 3y - z &= 7 \\ 2x + y - 5z &= 7 \end{aligned}$$

Find the rank of the matrix $\begin{bmatrix} 1 & -2 & 0 & 3 & 2 \\ 3 & -1 & 1 & 3 & 4 \\ 3 & 4 & 2 & -3 & 2 \\ 0 & -5 & -1 & 6 & 2 \end{bmatrix}$.

Are the matrices $\begin{bmatrix} 1 & 1 & 1 \\ 2 & 3 & -1 \\ -1 & 4 & 1 \end{bmatrix}$ and $\begin{bmatrix} 1 & 0 & -1 \\ 1 & 1 & 1 \\ 0 & 1 & 3 \end{bmatrix}$ row equivalent? Why or why not?

Solve the linear system

$$\begin{aligned} 3w + 8x - 18y + z &= 35 \\ w + 2x - 4y &= 11 \\ w + 3x - 7y + z &= 10 \end{aligned}$$

**EXERCISE 4.3**

1. Given $u^t = [5 \quad 1 \quad 3]$, $v^t = [3 \quad 1 \quad -1]$, $w^t = [7 \quad 5 \quad 8]$, and $x^t = [x_1 \quad x_2 \quad x_3]$, write out the column vectors, $u$, $v$, $w$, and $x$, and find

(a) $uv^t$ (c) $xx^t$ (e) $u^tv$ (g) $u^tu$

(b) $uw^t$ (d) $v^tu$ (f) $w^tx$ (h) $x^tx$