

12/1/2023

6.2 Homework

1. $u_1 \cdot u_3 = 2 \neq 0$ not ortho. set

5. $u_1 \cdot u_2 = 0$, $u_1 \cdot u_3 = 0$, $u_2 \cdot u_3 = 0$
yes ortho. set

7. $u_1 \cdot u_2 = 12 - 12 = 0$

THM 4. $x \cdot u_1 = 39$, $u_1 \cdot u_1 = 13 \rightarrow \frac{39}{13} u_1 = 3u_1$

$x \cdot u_2 = 26$, $u_2 \cdot u_2 = 52 \rightarrow \frac{1}{2} u_2$

$x = 3u_1 + \frac{1}{2}u_2$

11. $\frac{y \cdot u}{u \cdot u} u = \frac{10}{20} u = \frac{1}{2} \begin{bmatrix} -4 \\ 2 \end{bmatrix} = \begin{bmatrix} -2 \\ 1 \end{bmatrix}$

14. $\hat{y} = \frac{20}{30} u = \frac{2}{3} \begin{bmatrix} 7 \\ 1 \end{bmatrix} = \begin{bmatrix} 14/3 \\ 2/3 \end{bmatrix} \Rightarrow y - \hat{y} = \begin{bmatrix} -4/5 \\ 2/5 \end{bmatrix}$
 $y = \begin{bmatrix} 14/5 \\ 2/5 \end{bmatrix} + \begin{bmatrix} -4/5 \\ 2/5 \end{bmatrix}$

17. $u \cdot v = 0 \Rightarrow -\frac{1}{3} \cdot \frac{1}{2} + \frac{1}{3} \cdot \frac{1}{2} = 0$

$\frac{u}{\|u\|} = \begin{bmatrix} \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \\ \frac{1}{\sqrt{3}} \end{bmatrix}$

$\frac{v}{\|v\|} = \begin{bmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \\ 0 \end{bmatrix}$

23. a. True \Rightarrow inner prod. = 0 \Rightarrow orthon

b. True $c_{ij} = \frac{y_i u_j}{u_j u_j}$

c. False, normalizing only affects magnitudes

27. THM 4. since col = orthog \Rightarrow must
be linearly independent
 $m \times m$ with full rank = invertible

S.T. 6.2 set where all vectors
are orthog. to each other