

$$A. 1) \quad \underline{w}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad \underline{w}_2 = \begin{bmatrix} 2 \\ 0 \\ 2 \end{bmatrix} - \frac{4}{3} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 2/3 \\ -4/3 \\ 2/3 \end{bmatrix}$$

$$2) \quad \underline{w}_1 \cdot \underline{w}_2 = 0$$

$$3) \quad \underline{u}_1 = \begin{bmatrix} 1/\sqrt{3} \\ 1/\sqrt{3} \\ 1/\sqrt{3} \end{bmatrix} \quad \underline{u}_2 = \frac{1}{\left(\frac{2}{3}\sqrt{6}\right)} \begin{bmatrix} 2/3 \\ -4/3 \\ 2/3 \end{bmatrix} = \begin{bmatrix} 1/\sqrt{6} \\ -2/\sqrt{6} \\ 1/\sqrt{6} \end{bmatrix}$$

$$4) \quad \underline{u}_1 \cdot \underline{u}_1 = 1 \quad \underline{u}_1 \cdot \underline{u}_2 = 0 \quad \underline{u}_2 \cdot \underline{u}_2 = 1$$

$$5) \quad \begin{bmatrix} 2 \\ 2 \\ 2 \end{bmatrix}$$

$$B. 1) \quad \underline{w}_1, \underline{w}_2 \text{ same, } \underline{w}_3 = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$$

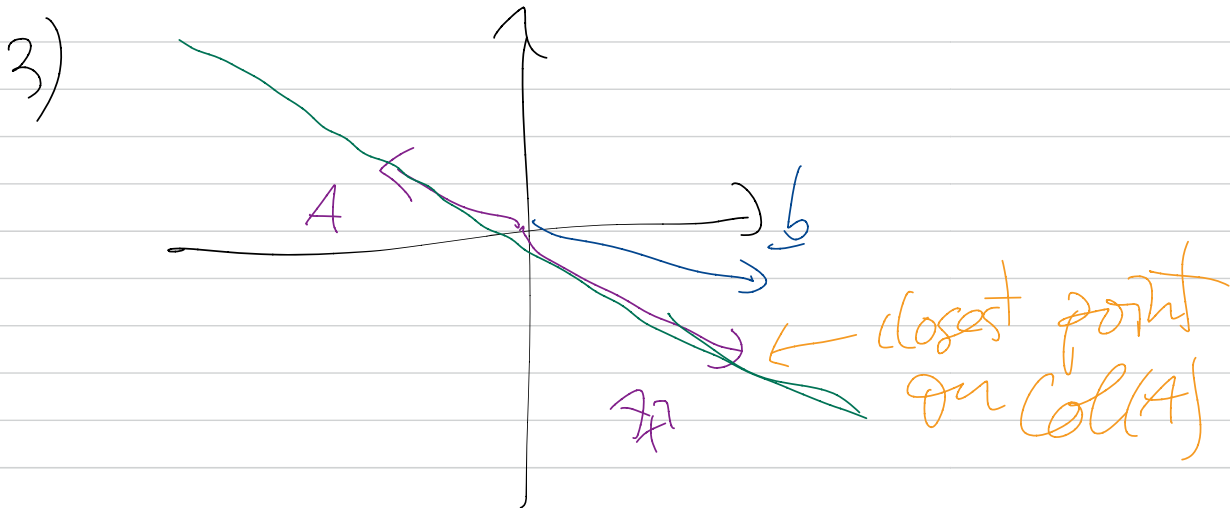
$$2) \quad \underline{u}_1, \underline{u}_2 \text{ same, } \underline{u}_3 = \begin{bmatrix} 1/\sqrt{2} \\ 0 \\ -1/\sqrt{2} \end{bmatrix}$$

$$3) \quad \{ \underline{u}_3 \}$$

C. 1) ~~no~~

$$2) \begin{bmatrix} 7 & 3 \end{bmatrix} \vec{x} = \begin{bmatrix} -17 \end{bmatrix}$$

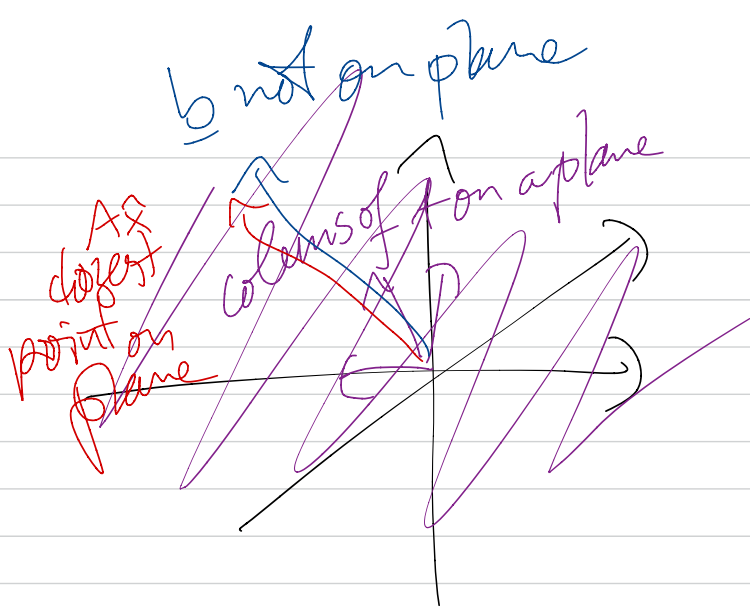
$$\vec{x} = \begin{bmatrix} -17 \\ 13 \end{bmatrix}$$



D. 1) ~~no~~

$$2) \begin{bmatrix} -1 & 0 & -2 \\ 0 & 2 & 1 \\ 2 & 2 & 2 \end{bmatrix} \begin{bmatrix} -1 & 0 & 1 \\ 0 & 1 & 1 \\ -1 & 1 & 2 \end{bmatrix} \vec{x} = \begin{bmatrix} 1 & 0 & -2 \\ 0 & 2 & 1 \\ 2 & 1 & 2 \end{bmatrix} \begin{bmatrix} 2 \\ -1 \\ 2 \end{bmatrix}$$

$$\vec{x} = \begin{bmatrix} -7/3 \\ 2/3 \\ 0 \end{bmatrix} + x_3 \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$$



E. 1) yes $\frac{1}{2}x - \frac{7}{2}$

2) no

3)
$$\begin{bmatrix} 1 & 2 & 5 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 2 & 1 \\ 5 & 1 \end{bmatrix} \begin{bmatrix} 5 \\ 4 \\ 3 \end{bmatrix} = \begin{bmatrix} 7 & 25 \\ 7 & 21 \end{bmatrix} \begin{bmatrix} 5 \\ 4 \\ 3 \end{bmatrix}$$

$$\begin{bmatrix} 30 & 8 \\ 8 & 3 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} 24 \\ 22 \end{bmatrix}$$

$$\Rightarrow y = \frac{12}{13}x + \frac{84}{13}$$

4) line $y=f(x)$ minimizes

$$(5-f(1))^2 + (4-f(2))^2 + (3-f(5))^2$$

5) least squares...

F. 1) no

2) no

3) all poly of deg ≤ 2

$$\{t^2, (t-1)^2, (t-2)^2\}$$

$$\begin{aligned} 6. 1) E(p(t)+q(t)) &= \begin{bmatrix} p(0)+q(0) \\ \vdots \end{bmatrix} = \begin{bmatrix} p(0) \\ \vdots \end{bmatrix} + \begin{bmatrix} q(0) \\ \vdots \end{bmatrix} \\ &= E(p(t)) + E(q(t)) \end{aligned}$$

$$E(c p(t)) = \begin{bmatrix} c p(0) \\ \vdots \\ c p(0) \end{bmatrix} = c \begin{bmatrix} p(0) \\ \vdots \\ p(0) \end{bmatrix} \\ = c E(p(t)).$$

2) quadratic w/ roots 0, 1, 2, 3
 \Rightarrow only 203.

3) Span $\left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 4 \\ a \end{bmatrix} \right\}$
 basis for it

H, I. omitted.

