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1F_5 b)

$$A^2 = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$$

$$A^3 = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$$

$$A^n = \begin{pmatrix} 1 & n \\ 0 & 1 \end{pmatrix}$$

1F-8 a)

$$A = \begin{pmatrix} 2 & -1 & 1 \\ 3 & 0 & 1 \\ 1 & 4 & -1 \end{pmatrix}$$

1G-3 $$A^{-1} = \frac{1}{5}\begin{pmatrix} 3 & 1 & -2 \\ -1 & 3 & -1 \\ 1 & 2 & 1 \end{pmatrix}$$

$$A^{-1}b = \begin{pmatrix} 0 \\ -1 \\ 1 \end{pmatrix}$$

1G-4

$$A = \begin{pmatrix} 1 & -1 & 1 \\ 1 & 1 & 0 \\ -1 & -1 & 2 \end{pmatrix}\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix}$$

$$A^{-1} = \frac{1}{5}\begin{pmatrix} 3 & 1 & -2 \\ -1 & 3 & -1 \\ 1 & 2 & 1 \end{pmatrix}$$

1G_5 $(AB)(B^{-1}A^{-1}) = I$

~~2~~ 1H-3 a) $|A| = 0 \rightarrow c = -8$

b) $\begin{vmatrix} 2-c & 1 \\ 0 & -1-c \end{vmatrix} = 0 \rightarrow c = 2, -1$

c) $\langle 1, -1, 1 \rangle \times \langle 2, 1, 1 \rangle = \langle -2, 1, 3 \rangle$

for $c = 8$

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1E-1 c)
$$\begin{vmatrix} i & j & k \\ 1 & -1 & 1 \\ -2 & 3 & 1 \end{vmatrix} = -4i - 3j + k$$

d) $\langle a,0,0\rangle - \langle 0,b,0\rangle$

$= \langle a,-b,0\rangle$

$\langle a,0,a\rangle - \langle 0,0,c\rangle$

$= \langle a,0,-c\rangle$

$$\begin{vmatrix} i & j & k \\ a & -b & 0 \\ a & 0 & -c \end{vmatrix} = bci + acj + abk$$

$= \langle bc, ac, +ab\rangle$

$\to bcx + acy + abz = abc$

$\to \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$

1E-2

$$\cos\theta = \frac{\langle 2,-1,1\rangle \cdot \langle 1,1,2\rangle}{|\langle 2,-1,1\rangle|\,|\langle 1,1,2\rangle|} = \frac{3}{6} = \frac{1}{2}$$

$\to \theta = 60^\circ$

1E-6 $$D = \frac{\vec{OP}\cdot\vec{N}}{|\vec{N}|} = \vec{OP}\cdot\hat{N}$$

$$= \frac{|x_0 a + x_1 b + x_2 c|}{\sqrt{a^2+b^2+c^2}} = \frac{|d|}{\sqrt{a^2+b^2+c^2}}$$

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# Part II

## Problem 1

a) 

b) all $L_i$s are parallel so $n_i$s are too

c) $(n_1 \times n_2)\cdot n_3 = \cancel{\ldots} = 0$

$(n_2 \times n_3 \cdot n_3 = 0$

## Problem 2

a) $A\,\cancel{x}^{P} = \cancel{b}^{M}$

$$A = \cancel{\begin{pmatrix} & & \\ 1 & 3 & 5 \\ 3 & 5 & 8 \end{pmatrix}} = \begin{pmatrix} 1/6 & 1/9 & 3/16 \\ 1/3 & 1/3 & 5/16 \\ 1/2 & 5/9 & 1/2 \end{pmatrix}$$

$$P = \begin{pmatrix} P_{m_1} \\ P_{m_2} \\ P_{m_3} \end{pmatrix}$$

$$b = \begin{pmatrix} m_1 \\ m_2 \\ m_3 \end{pmatrix}$$

b) $$P = A^{-1}(m) = \begin{bmatrix} -6 & 42 & -24 \\ -9 & -9 & 9 \\ 16 & -32 & 16 \end{bmatrix} \begin{bmatrix} m_1 \\ m_2 \\ m_3 \end{bmatrix}$$

$$P = \begin{bmatrix} 144 \\ 288 \\ 432 \end{bmatrix}$$

c) $$A = \begin{bmatrix} 1/6 & 1/9 & \frac{1}{2}\left(\frac{1}{6}+\frac{1}{9}\right) \\ 1/3 & 1/3 & 1/3 \\ 1/2 & 5/9 & \frac{1}{2}\left(\frac{1}{2}+\frac{5}{9}\right) \end{bmatrix}$$

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# Problem 3

a) $w = (n \times k) \times n$

b) $((u \times v) \times k) \times (u \times v)$