1. Give a set of two different non-zero vectors in $\mathbb{R}^2$ that are not a basis for $\mathbb{R}^2$. Why are they not?

$\left\{ \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 4 \end{bmatrix} \right\}$ don't span
not indep

2. Give a set of vectors that span $\mathbb{R}^2$ but are not a basis for $\mathbb{R}^2$. Why are they not?

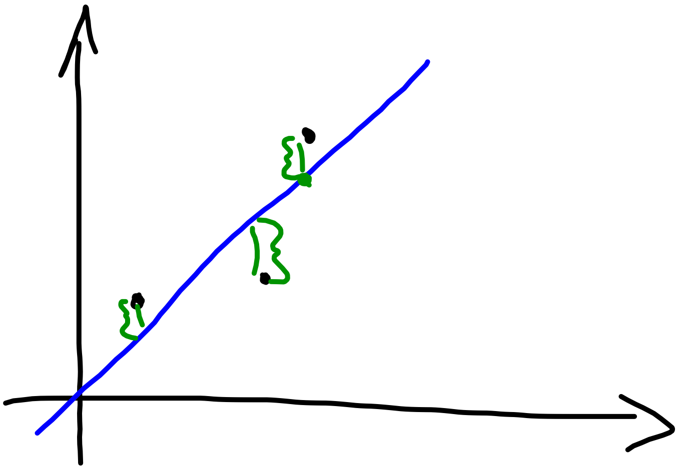
$\left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix} \right\}$ not indep

③ Give a set of independent vectors (more than one) in $\mathbb{R}^3$ that are not a basis for $\mathbb{R}^3$. Why are they not?

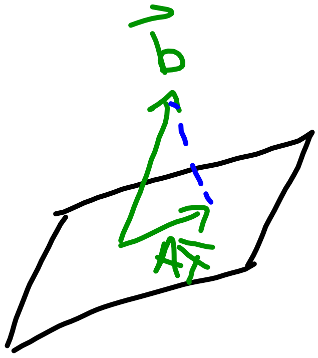
not scalar multiples

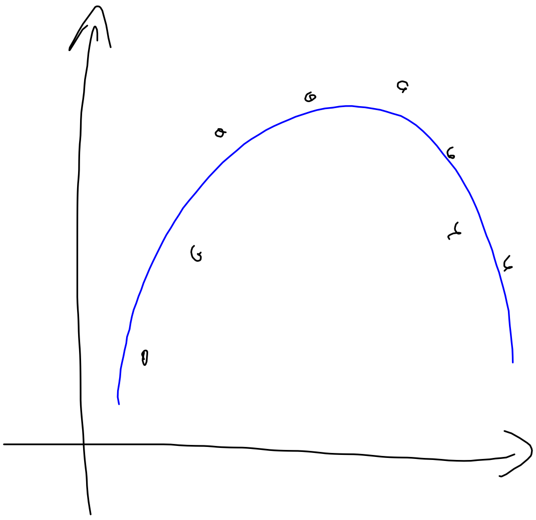
Not a basis because they don't span $\mathbb{R}^3$.

$$\left\{ \begin{bmatrix} \\ \\ \\ \end{bmatrix}, \begin{bmatrix} \\ \\ \\ \end{bmatrix} \right\}$$



$\|\vec{b} - A\vec{x}\|$

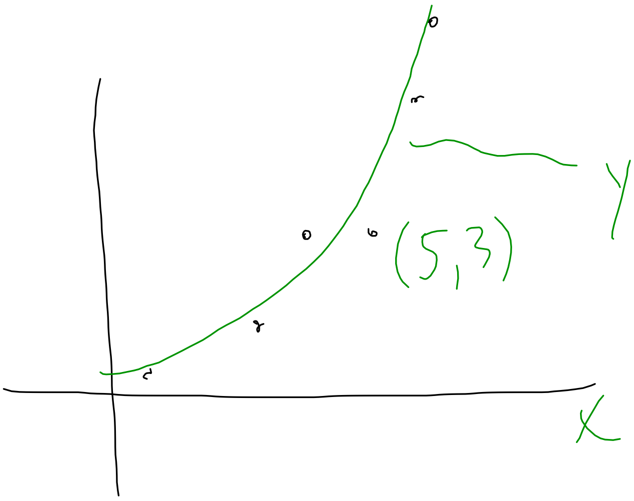




$y = ax^2 + bx + c$

$A\vec{x} = \vec{b}$

$\vec{x} = (A^T A)^{-1} A^T \vec{b}$



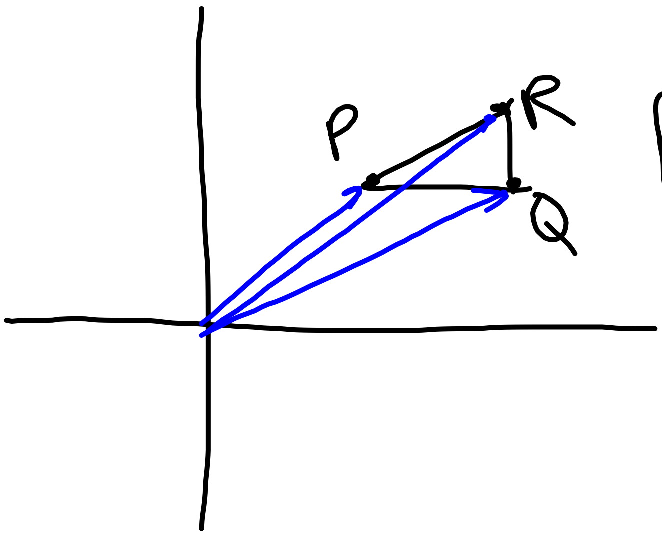
$y = Ce^{kx}$

$3 = Ce^{5k}$

$\ln 3 = \ln Ce^{5k}$

$\ln 3 = \ln C + \ln e^{5k}$

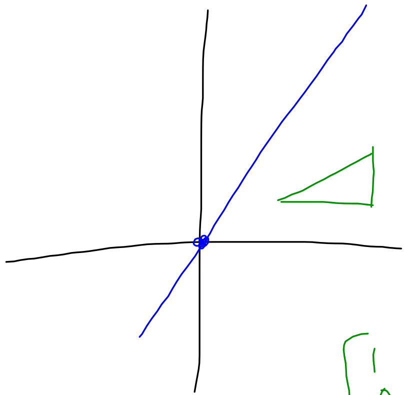
$\ln 3 = \ln C + 5k$



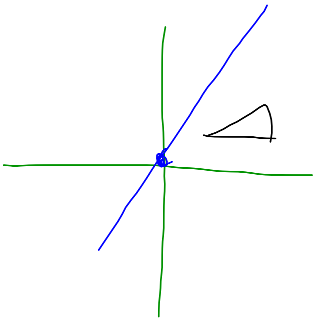
$$\begin{bmatrix} P & Q & R \end{bmatrix} = \begin{bmatrix} 2 & 4 & 4 \\ 1 & 1 & 2 \end{bmatrix}$$

$$\begin{bmatrix} * & * \\ * & * \end{bmatrix}\begin{bmatrix} \quad \end{bmatrix}$$

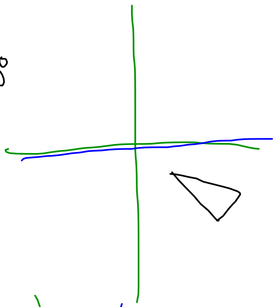
$$\begin{bmatrix} * & * & 0 \\ * & * & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} \text{[illegible]} \\ \text{[illegible]} \\ \ \end{bmatrix}$$



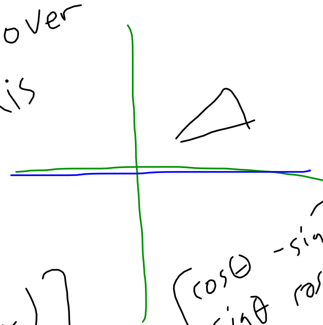
$$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$



$R_{-60°}$ $\Longrightarrow$



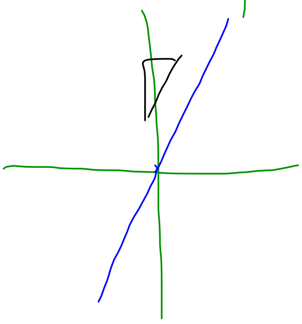
reflect over x-axis $\Longrightarrow$



$f[g(x)]$

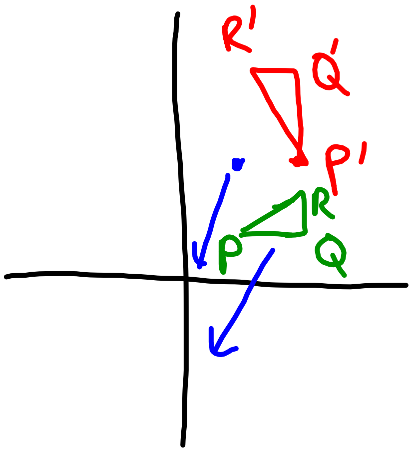
$\begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$

$R_{60°}$ $\Longrightarrow$



$R_{60°} B R_{-60°} \vec{x}$

Hmgns Coord Handout #8



1 Translate all points 2 left, 3 down.

$$T\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1 - 2 \\ x_2 - 3 \end{bmatrix} \qquad T\begin{bmatrix} -1 \\ 5 \end{bmatrix} = \begin{bmatrix} -3 \\ 2 \end{bmatrix}$$

$$T\begin{bmatrix} 2 \\ 3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

not linear

$$\underbrace{\begin{bmatrix} 1 & 0 & -2 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{bmatrix}}_{\text{Translation 2 left, 3 down.}} \begin{bmatrix} -1 \\ 5 \\ 1 \end{bmatrix} = \begin{bmatrix} -3 \\ 2 \\ 1 \end{bmatrix}$$

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

$$A^{-1} \overset{?}{=} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$$

The rotation is

$$B = \left[\begin{array}{cc|c} 0 & -1 & 0 \\ 1 & 0 & 0 \\ \hline 0 & 0 & 1 \end{array}\right]$$

$$\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$$

$$A^{-1}BA = \begin{bmatrix} 0 & -1 & 5 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$