Math 320, Linear Algebra I, Quiz 4, February 8, 20012, Instructor: S. Friedland
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Show all work. **Unjustified** answer yields no credit.

Decide if each set is a basis in the corresponding vector space.

a. $(1,2)^\top, (1,0)^\top, (0,1)^\top$ in $\mathbb{R}^2$.
b. $x^3 + 2x^2 + 3x + 4,\ 2x^3 + 3x^2 + 4x + 5,\ 3x^3 + x - 2$ in P_3.
c. $(1,1,-1)^\top, (2,1,0)^\top, (3,2,1)^\top$ in $\mathbb{R}^3$.

2 a. Not in $\mathbb{R}^2$ number of vector in a basis is 2

2 b. Not in P_3 number of vectors in a basis is 4

c. $R_2 - R_1 \to$, $R_3 + R_1$

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ -1 & 0 & 1 \end{bmatrix} \sim \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & -1 \\ 0 & 2 & 4 \end{bmatrix} \underset{R_3 - 2R_2}{\overset{-R_2 \to R_2}{\sim}} \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 0 & 2 & 4 \end{bmatrix} \sim$$

2

$\frac{1}{2}R_3 \to R_3$

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 0 & 0 & 2 \end{bmatrix} \sim \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

2

$\operatorname{rank} A = 3$

So the ~~three~~ column are lin. ind. Hence the original 3 vectors form a basis in $\mathbb{R}^3$. 2