

FIND THE VALUES OF  $x$ , if any, for which the vectors  
 $\mathbf{x}_1 = (1, 3, 4)$ ,  $\mathbf{x}_2 = (2, -1, 1)$ ,  $\mathbf{x}_3 = (1, x, 2x)$   
 Are linearly dependent.  $n = k = 3$

$$\det A = \begin{vmatrix} 1 & 2 & 1 \\ 3 & -1 & x \\ 4 & 1 & 2x \end{vmatrix} \xrightarrow{\substack{R_2 \rightarrow 3R_1 \\ R_4 \rightarrow 4R_1}} \begin{vmatrix} 1 & 2 & 1 \\ 0 & -7 & x-3 \\ 0 & -7 & 2x-4 \end{vmatrix} = (-1)^{1+1} (1) \begin{vmatrix} -7 & x-3 \\ -7 & 2x-4 \end{vmatrix}$$

$$\Rightarrow -7(2x-4) - (-7)(x-3)$$

$$\Rightarrow -14x + 28 + 7x - 21$$

$$\Rightarrow 7x + 7 \Rightarrow (-7)(x+1) \neq 0$$

$$x \neq -1 \quad (\text{for all } x)$$

~~Both vectors non-zero therefore~~  
~~so, non-coplanar so linearly independent~~