Math 241 Quiz # 3b

Name: Solution Serial # ______

1. Write the vector $h = (2,-7,9)$ as a linear combination of the vectors u, v, and w where $u = (1,-1,2)$, $v = (3,0,1)$, $w = (1,-2,2)$.

$$h = c_1 u + c_2 v + c_3 w$$

$$(2,-7,9) = c_1(1,-1,2) + c_2(3,0,1) + c_3(1,-2,2)$$
$$= (c_1+3c_2+c_3, -c_1-2c_3, 2c_1+c_2+2c_3)$$

$$\Rightarrow \begin{cases} c_1 + 3c_2 + c_3 = 2 \\ -c_1 \quad\quad - 2c_3 = -7 \\ 2c_1 + c_2 + 2c_3 = 9 \end{cases}$$

Solving this system, we get $c_1 = 3$, $c_2 = -2$, $c_3 = 2$

$$\therefore (2,-7,9) = 3(1,-1,2) - 2(3,0,1) + 2(1,-2,2)$$

$$h = 3u - 2v + 2w$$

2. Choose the correct answer:

The set $S = \{(3,1,0,2),(1,5,11,0),(3,3,3,1)\}$ in R^4 is:
(a) a basis for R^4 (b) a spanning set for R^4 (c) not a basis (d) linearly dependent

$|S| = 3 < 4$ i.e. 3 vectors in $\mathbb{R}^4$ will not span $\mathbb{R}^4 \Rightarrow S$ is not a basis.

3. Show that the set of functions $\{\cos x, \sin x\}$ is linearly independent.

$$W(\cos x, \sin x) = \begin{vmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{vmatrix} = \cos^2 x + \sin^2 x$$
$$= 1$$
$$\neq 0$$

$\therefore \{\cos x, \sin x\}$ is linearly indep.