Homework Solution

§2.2

#1b. $u = \begin{bmatrix}1\\0\\3\end{bmatrix}$ $v = \begin{bmatrix}0\\2\\-1\end{bmatrix}$; $w = \begin{bmatrix}2\\6\\3\end{bmatrix} = 2\begin{bmatrix}1\\0\\3\end{bmatrix} + 3\begin{bmatrix}0\\2\\-1\end{bmatrix} = 2u+3v$

#3. (a) u, v non-zero, non-parallel vectors in $\mathbb{R}^3$.

Span$\{u,v\}$ is a plane in $\mathbb{R}^3$ that goes through the origin.

(b) $p \in$ Span$\{u,v\}$: Span$\{u,v,p\}$ = Span$\{u,v\}$ (plane)

$q \notin$ Span$\{u,v\}$: Span$\{u,v,q\} = \mathbb{R}^3$.

#4a. Span$\{i,j\}$ is the x-y plane $(z=0)$

Span$\{j\}$ is the y-axis $(x=0, z=0)$

Span$\{j,k\}$ is the y-z plane $(x=0)$

Span$\{j+k\}$ is the line $z=y$ in the y-z plane $(x=0)$.

#8. (a) True, u, v non-zero & non-parallel in $\mathbb{R}^2 \Rightarrow$ Span$\{u,v\} = \mathbb{R}^2$.

(b) False, if $w = u+v$ (with u,v non-zero & non-parallel), then w is non-zero and not parallel to either u or v, but Span$\{u,v,w\}$ = Span$\{u,v\}$ which will be a plane in $\mathbb{R}^3$.

(c) False. $u = \begin{bmatrix}1\\0\\1\end{bmatrix}$ & $v \in \begin{bmatrix}0\\1\\1\end{bmatrix}$ are vectors in $\mathbb{R}^3$, not $\mathbb{R}^2$.

(d) False Span$\left\{\begin{bmatrix}1\\0\end{bmatrix}, \begin{bmatrix}1\\1\end{bmatrix}\right\}$ is all of $\mathbb{R}^2$.

#10. (a) linear combinations, span

(b) spanned

(c) Span, v_1 & v_2.