(a) **True**

**Proof:** Let $A$ be an invertible symmetric matrix. From theorem 6(c), $(A^{-1})^T = (A^T)^{-1}$.

Since $A$ is symmetric, $A^T = A$. Thus $(A^{-1})^T = A^{-1}$, i.e. $A^{-1}$ is symmetric.

(b) **False.**

$c_1, c_2, \ldots, c_p$ all can be zero in a linear combination and the resulting is zero vector.

(c) **True.**

A linear combination of $u$ and $v$ with weights $c_1, c_2$ can be thought as the vector corresponding to the fourth vertex of the parallelogram with other three vertices being the origin, points corresponding to vectors $c_1u$ and $c_2v$. Thus the point corresponding to vector $c_1u + c_2v$ is on the same plane as points origin, corresponding points to $c_1u$ and $c_2v$. Thus any linear combination of $u$ and $v$ lies on the plane through the origin. Thus span $\{u, v\}$ is always visualized as a plane through the origin.
(d) True:
If $w$ is in $\text{span}(u, v)$, then there exists weights $c_1, c_2$ not both zero such that $w = c_1 u + c_2 v$.
Thus we have $c_1 u + c_2 v - w = 0$ and thus the matrix equation $Ax = 0$, where columns of $A$ being $u, v, w$ has a non-trivial solution, namely $\begin{pmatrix} c_1 \\ c_2 \\ -1 \end{pmatrix}$.

Thus $\{u, v, w\}$ linearly dependent.

(e) True:
Suppose $\{u_1, u_2, u_3, u_4\}$ linearly independent in $\mathbb{R}^4$.
Now suppose consider the linear combination $c_1 u_1 + c_2 u_2 + c_3 u_3 + 0 u_4 = 0$.
This is equivalent to $c_1 u_1 + c_2 u_2 + c_3 u_3 + 0 u_4 = 0$ which equivalent to say $\begin{pmatrix} c_1 \\ c_2 \\ c_3 \\ 0 \end{pmatrix}$ is a solution to the matrix equation $Ax = 0$, where columns of $A$ are $u_1, u_2, u_3$ and $u_4$. But since $\{u_1, u_2, u_3, u_4\}$ linearly independent, $Ax = 0$ has only the trivial solution.
Thus $c_1, c_2, c_3$ all must be zero.
Thus $\{u_1, u_2, u_3\}$ linearly independent.
(f) **True:**

Since linear transformation is a function, 

\[ T(0) \]

is a unique element in \( \mathbb{R}^m \).

Since \( 0 + 0 = 0 \) and \( T \) a linear transformation,

\[ T(0) = T(0 + 0) = T(0) + T(0) \]

Thus \( T(0) = 0 \)

(g) **No:**

\[ T(\begin{pmatrix} 0 \\ 0 \end{pmatrix}) = 3(\begin{pmatrix} 0 \\ 0 \end{pmatrix}) + (\begin{pmatrix} 1 \\ 2 \end{pmatrix}) = (\begin{pmatrix} 1 \\ 2 \end{pmatrix}) \neq (0) \]