A homogeneous equation is always consistent. TRUE - The trivial solution is always a solution.

The equation $Ax = 0$ gives an explicit description of its solution set. FALSE - The equation gives an implicit description of the solution set.

The homogeneous equation $Ax = 0$ has the trivial solution if and only if the equation has at least one free variable. FALSE - The trivial solution is always a solution to the equation $Ax = 0$.

The equation $\mathbf{x} = \mathbf{p} + t\mathbf{v}$ describes a line through $\mathbf{v}$ parallel to $\mathbf{p}$. False. The line goes through $\mathbf{p}$ and is parallel to $\mathbf{v}$.

The solution set of $Ax = b$ is the set of all vectors of the form $\mathbf{w} = \mathbf{p} + \mathbf{v}_h$ where $\mathbf{v}_h$ is any solution of the equation $Ax = 0$ FALSE This is only true when there exists some vector $\mathbf{p}$ such that $A\mathbf{p} = b$. 
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▶ If $\mathbf{x}$ is a nontrivial solution of $A\mathbf{x} = \mathbf{0}$, then every entry in $\mathbf{x}$ is nonzero. FALSE. At least one entry in $\mathbf{x}$ is nonzero.

▶ The equation $\mathbf{x} = x_2\mathbf{u} + x_3\mathbf{v}$, with $x_2$ and $x_3$ free (and neither $\mathbf{u}$ or $\mathbf{v}$ a multiple of the other), describes a plane through the origin. TRUE

▶ The equation $A\mathbf{x} = \mathbf{b}$ is homogeneous if the zero vector is a solution. TRUE. If the zero vector is a solution then $\mathbf{b} = A\mathbf{x} = A\mathbf{0} = \mathbf{0}$. So the equation is $A\mathbf{x} = \mathbf{0}$, thus homogenous.

▶ The effect of adding $\mathbf{p}$ to a vector is to move the vector in the direction parallel to $\mathbf{p}$. TRUE. We can also think of adding $\mathbf{p}$ as sliding the vector along $\mathbf{p}$.

▶ The solution set of $A\mathbf{x} = \mathbf{b}$ is obtained by translating the solution set of $A\mathbf{x} = \mathbf{0}$. FALSE. This only applies to a consistent system.
The columns of the matrix $A$ are linearly independent if the equation $Ax = 0$ has the trivial solution. FALSE. The trivial solution is always a solution.

If $S$ is a linearly dependent set, then each vector is a linear combination of the other vectors in $S$. FALSE- For example, $[1, 1]$, $[2, 2]$ and $[5, 4]$ are linearly dependent but the last is not a linear combination of the first two.

The columns of any $4 \times 5$ matrix are linearly dependent. TRUE. There are five columns each with four entries, thus by Thm 8 they are linearly dependent.

If $x$ and $y$ are linearly independent, and if $\{x, y, z\}$ is linearly dependent, then $z$ is in $\text{Span}\{x, y\}$. TRUE Since $x$ and $y$ are linearly independent, and $\{x, y, z\}$ is linearly dependent, it must be that $z$ can be written as a linear combination of the other two, thus in in their span.
Two vectors are linearly dependent if and only if they lie on a line through the origin. TRUE. If they lie on a line through the origin then the origin, the zero vector, is in their span thus they are linearly dependent.

If a set contains fewer vectors then there are entries in the vectors, then the set is linearly independent. FALSE For example, \([1, 2, 3]\) and \([2, 4, 6]\) are linearly dependent.

If \(x\) and \(y\) are linearly independent, and if \(z\) is in the \(\text{Span}\{x, y\}\) then \(\{x, y, z\}\) is linearly dependent. TRUE If \(z\) is in the \(\text{Span}\{x, y\}\) then \(z\) is a linear combination of the other two, which can be rearranged to show linear dependence.
If a set in $\mathbb{R}^n$ is linearly dependent, then the set contains more vectors than there are entries in each vector. False. For example, in $\mathbb{R}^3$ [1, 2, 3] and [3, 6, 9] are linearly dependent.
A linear transformation is a special type of function. TRUE
The properties are (i) $T(u + v) = T(u) + T(v)$ and (ii) $T(cu) = cT(u)$.

If $A$ is a $3 \times 5$ matrix and $T$ is a transformation defined by $T(x) = Ax$, then the domain of $T$ is $\mathbb{R}^3$. FALSE The domain is $\mathbb{R}^5$.

If $A$ is an $m \times n$ matrix, then the range of the transformation $x \mapsto Ax$ is $\mathbb{R}^m$ FALSE $\mathbb{R}^m$ is the codomain, the range is where we actually land.

Every linear transformation is a matrix transformation. FALSE. The converse (every matrix transformation is a linear transformation) is true, however. We (probably) will see examples of when the original statement is false later.
A transformation $T$ is linear if and only if
\[ T(c_1 \mathbf{v}_1 + c_2 \mathbf{v}_2) = c_1 T(\mathbf{v}_1) + c_2 T(\mathbf{v}_2) \]
for all $\mathbf{v}_1$ and $\mathbf{v}_2$ in the domain of $T$ and for all scalars $c_1$ and $c_2$. TRUE
If we take the definition of linear transformation we can derive these and if these are true then they are true for $c_1, c_2 = 1$ so the first part of the definition is true, and if $\mathbf{v} = 0$, then the second part if true.
Every matrix transformation is a linear transformation. TRUE

To actually show this, we would have to show all matrix transformations satisfy the two criterion of linear transformations.

The codomain of the transformation $\mathbf{x} \mapsto A\mathbf{x}$ is the set of all linear combinations of the columns of $A$. FALSE

The original statement in describing the range.

If $T: \mathbb{R}^n \to \mathbb{R}^m$ is a linear transformation and if $\mathbf{c}$ is in $\mathbb{R}^m$, then a uniqueness question is "Is $\mathbf{c}$ is the range of $T$?" FALSE

This is an existence question.

A linear transformation preserves the operations of vector addition and scalar multiplication. TRUE

This is part of the definition of a linear transformation.

The superposition principle is a physical description of a linear transformation. TRUE

The book says so. (page 77)