Homework 10, Section 2.1; 6, 1923, 27, 28

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Homework

6.

$$\begin{bmatrix} -5 & 22 \\ 12 & -22 \\ 3 & -2 \end{bmatrix}$$

19.

$Ab_3 = ab_1 + Ab_2$ since $A = A$.Therefore $b_3 = b_1 + b_2$

20.

$if Ab_1 = Ab_2$, then if you divide both sides by A then $b_1 = b_2$

21.

Let bp be the last column of B. By hypothesis, the last column of AB is zero. Thus, $Ab_p = 0$. However, b_p is not the zero vector, because B has no column of zeros. Thus, the equation $Ab_p = 0$ is a linear dependence relation among the columns of A, and so the columns of A are linearly dependent.

22.

If the columns of B are linearly dependent, then there exists a nonzero vector x such that $B_x = 0$. From this, $A(Bx) = A0$ and $(AB)x = 0$ (by associativity). Since x is nonzero, the columns of AB must be linearly dependent.

23.

If x satisfies $Ax = 0$, then $CAx = C0 = 0$ and so $I_n x = 0$ and $x = 0$.This means that the equation $Ax = 0$ has no free variables so every variable is a basic variable and every column of A is a pivot column meaning each pivot is in a different row, A must have at least as many rows as columns.

27.

$$uv^T = \begin{bmatrix} -2a & -2b & -2c \\ 3a & 3b & 3c \\ -4a & -4b & -4c \end{bmatrix}$$

$$vu^T = \begin{bmatrix} -2a & 3a & -4a \\ -2b & 3b & -4b \\ -2c & 3c & -4c \end{bmatrix}$$

28.

By Theorem 3, $(uv^T)^T = (v^T)^T u^T = vu^T$.