Recommended Book: "*Elementary Linear Algebra (Applications Version)*" by Howard Anton and Chris Rorres, 11th Edition, Wiley, USA, 2014.

Exercises (from the recommended book):

Exercise Set 1.3

True-False Exercises

TF. In parts (a)–(o) determine whether the statement is true or false, and justify your answer.

(a) The matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ has no main diagonal.

True, it is not a square matrix.

(b) An $m \times n$ matrix has m column vectors and n row vectors.

False, an m x n matrix has m row vectors and n column vectors.

(c) If A and B are 2×2 matrices, then $AB = BA$.

False, $AB \neq BA$ in general.

(d) The ith row vector of a matrix product AB can be computed by multiplying A by the ith row vector of B.

False, the ith row vector of AB is computed by multiplying the ith row vector of A by B.

(e) For every matrix A, it is true that $(A^T)^T = A$.

True

(f) If A and B are square matrices of the same order, then

$$\text{tr}(AB) = \text{tr}(A)\text{tr}(B)$$

False

(g) If A and B are square matrices of the same order, then

$$(AB)^T = A^T B^T$$

False

(h) For every square matrix A, it is true that $\text{tr}(A^T) = \text{tr}(A)$.

True

(i) If A is a 6×4 matrix and B is an $m \times n$ matrix such that B^TA^T is a 2×6 matrix, then $m = 4$ and $n = 2$.

True

(j) If A is an $n \times n$ matrix and c is a scalar, then $\text{tr}(cA) = c\,\text{tr}(A)$.

True

(k) If A, B, and C are matrices of the same size such that $A - C = B - C$, then $A = B$.

True

(l) If A, B, and C are square matrices of the same order such that $AC = BC$, then $A = B$.

False

(m) If $AB + BA$ is defined, then A and B are square matrices of the same size.

True

(n) If B has a column of zeros, then so does AB if this product is defined.

True

(o) If B has a column of zeros, then so does BA if this product is defined.

False