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Problem Set 2

1. Given the following matrices,

$$p = \begin{bmatrix} 3 & 7 & 4 \\ 5 & 6 & 6 \\ 7 & 3 & 2 \end{bmatrix}, p^{-1} = \begin{bmatrix} \frac{-3}{49} & \frac{-1}{49} & \frac{9}{49} \\ \frac{16}{49} & \frac{-11}{49} & \frac{1}{49} \\ \frac{-27}{98} & \frac{20}{49} & \frac{-17}{98} \end{bmatrix}$$

   Find $p \cdot p^{-1}$.

2. Given the following matrices,

$$a = \begin{bmatrix} 3 & 7 \\ 5 & 6 \end{bmatrix}, b = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$$

   Is $a + b$ defined? If so, find $a + b$.

3. Given the following matrices,

$$c = \begin{bmatrix} 3 & 7 \\ 5 & 6 \end{bmatrix}, d = \begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$$

   Is $c + d$ defined? If so, find $c + d$.

4. Given the following matrices,

$$m = \begin{bmatrix} 10 & 20 \\ 30 & 40 \end{bmatrix}, n = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$$

   Find $m - n$ and $n - m$. Is subtraction commutable?

5. Given the following matrices,

$$u = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, v = \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$$

   Find $u \otimes v$. Remember $u \otimes v = u^v$. Hand in this exercise in LaTeX.

6. Given the following matrix,

$$g = \begin{bmatrix} 3 & 4 \\ 6 & 8 \end{bmatrix},$$

   Is g^{-1} defined? (i.e. is g invertible?) Hint: use the determinant test.

7. Given the following matrices,

$$x = \begin{bmatrix} 1 & 2 \\ 1 & 3 \\ 1 & 4 \end{bmatrix}, y = \begin{bmatrix} 3 \\ 1 \\ 2 \end{bmatrix}$$

   Find $(x^\top x)^{-1} x^\top y$. The answer is a vector of size 2×1 (two rows, one column, i.e. two scalars only). If you end up with something larger than that, something went wrong.