Math 3333, Quiz I, August 30, 2007

$$A = \begin{pmatrix} 2 & 4 \\ 7 & -1 \end{pmatrix}, B = \begin{pmatrix} 1 & 0 \\ 0 & 2 \\ 3 & 0 \end{pmatrix}, C = \begin{pmatrix} 1 & -1 & 0 \\ 0 & 2 & 6 \\ -3 & 0 & 1 \end{pmatrix}, D = \begin{pmatrix} 5 & -1 & 0 \\ 2 & -3 & 0 \end{pmatrix}$$

If possible, evaluate the following

1. (8 points) $C.B.D$

$$\begin{aligned} C.B &= \begin{pmatrix} 1 & -1 & 0 \\ 0 & 2 & 6 \\ -3 & 0 & 1 \end{pmatrix} . \begin{pmatrix} 1 & 0 \\ 0 & 2 \\ 3 & 0 \end{pmatrix} \\ &= \begin{pmatrix} (1)(1)+(-1)(0)+(0)(3) & (1)(0)+(-1)(2)+(0)(0) \\ (0)(1)+(2)(0)+(6)(3) & (0)(0)+(2)(2)+(6)(0) \\ (-3)(1)+(0)(0)+(1)(3) & (-3)(0)+(0)(2)+(1)(0) \end{pmatrix} = \begin{pmatrix} 1 & -2 \\ 18 & 4 \\ 0 & 0 \end{pmatrix} \\ C.B.D &= \begin{pmatrix} 1 & -2 \\ 18 & 4 \\ 0 & 0 \end{pmatrix} . \begin{pmatrix} 5 & -1 & 0 \\ 2 & -3 & 0 \end{pmatrix} \\ &= \begin{pmatrix} (1)(5)+(-2)(2) & (1)(-1)+(-2)(-3) & (1)(0)+(-2)(0) \\ (18)(5)+(4)(2) & (18)(-1)+(4)(-3) & (18)(0)+(4)(0) \\ (0)(5)+(0)(2) & (0)(-1)+(0)(-3) & (0)(0)+(0)(0) \end{pmatrix} \\ &= \begin{pmatrix} 1 & 5 & 0 \\ 98 & -30 & 0 \\ 0 & 0 & 0 \end{pmatrix}. \end{aligned}$$

2. (4 points) $(A^T.D^T.C)^T$ Not possible.
   A^T is a 2×2 matrix and D^T is a 3×2 matrix and hence their sizes do not match.

3. (8 points) $A + B^T D^T$

$$B^T = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 2 & 0 \end{pmatrix} \qquad D^T = \begin{pmatrix} 5 & 2 \\ -1 & -3 \\ 0 & 0 \end{pmatrix}$$

$$\begin{aligned} B^T.D^T &= \begin{pmatrix} 1 & 0 & 3 \\ 0 & 2 & 0 \end{pmatrix} . \begin{pmatrix} 5 & 2 \\ -1 & -3 \\ 0 & 0 \end{pmatrix} \\ &= \begin{pmatrix} (1)(5)+(0)(-1)+(3)(0) & (1)(2)+(0)(-3)+(3)(0) \\ (0)(5)+(2)(-1)+(0)(0) & (0)(2)+(2)(-3)+(0)(0) \end{pmatrix} = \begin{pmatrix} 5 & 2 \\ -2 & -6 \end{pmatrix} \end{aligned}$$

$$A + B^T.D^T = \begin{pmatrix} 2 & 4 \\ 7 & -1 \end{pmatrix} + \begin{pmatrix} 5 & 2 \\ -2 & -6 \end{pmatrix} = \begin{pmatrix} 7 & 6 \\ 5 & -7 \end{pmatrix}$$