

## 1.7 Special Matrices

**MATH 294**      **SPRING 1985**      **FINAL**      **# 12**      294SP85FQ12.tex

**1.7.1**    The matrix  $\underline{A}$  could be ( $\underline{A}$  is real 2 x 2)

- a) A symmetric matrix.
- b) A skew symmetric matrix.
- c) Neither symmetric or skew symmetric.
- d) Either (a), or (b), or (c).

**MATH 293**      **SPRING 1990**      **PRELIM 3**      **# 3**      293SP90P3Q3.tex

**1.7.2**    a) Let  $A$  be a 3 x 3 symmetric matrix, with eigenvalues -1, 1, 2. If  $B = A - bI$  and  $b$  is a scalar, for what values of  $b$  is  $B$

- i) positive definite?
- ii) positive semidefinite?
- iii) indefinite?

b) Find all matrices  $R = \begin{bmatrix} c & 0 \\ 0 & d \end{bmatrix}$  which are orthogonal.

**MATH 293**      **Unknown**      **FINAL**      **# 6**      293xxFQ6.tex

**1.7.3**    Let  $A$  be a square matrix with  $\det A \neq 0$ . Let  $S$  be symmetric,  $S^2 = A^t A$ .

- a) Show that  $AS^{-1}$  is orthogonal.
- b) Show that  $S^2$  is positive definite.

**MATH 293**      **Unknown**      **FINAL**      **# 17**      293xxFQ17.tex

**1.7.4**    Let  $A = \begin{bmatrix} 3 & 0 & 1 \\ 0 & -1 & 0 \\ 1 & 0 & 3 \end{bmatrix}$ .

- a) Find an orthogonal matrix  $C$  and a diagonal matrix  $D$ , such that  $CAC^{-1} = D$
- b) Use (a) to determine whether  $A$  is positive definite, semidefinite or indefinite.