CSCI933 Machine Learning:
Assignment #1

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Problem 1

$\because S^t = \begin{pmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix} = S^{-1}$, $\therefore S$ is an orthogonal matrix.

As $(SPS^t)^t = SP^tS^t$, $PP^t = SPS^tSP^tS^t = SPP^tS^t = SP(SP)^t$ is a diagonal matrix.

$SPS^t = \begin{pmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix} \begin{pmatrix} 1 & 3 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix} =$

Problem 2

(a) $SS^t = \begin{bmatrix} cos\alpha & sin\alpha \\ -sin\alpha & cos\alpha \end{bmatrix} \begin{bmatrix} cos\alpha & -sin\alpha \\ sin\alpha & cos\alpha \end{bmatrix} = I_2$, S is orthogonal.

(b)

$tan2\alpha = \frac{2tan\alpha}{1-tan^2\alpha}$ $B^t = SA^tS^t, BB^t = SA(SA)^t$

Problem 3

Problem 4