ASSIGNMENT 2 - due 12 Feb, 2016

1. Find the first two iterations of the SOR method with $\omega = 1.1$ for the following linear system, using $\mathbf{x}^{(0)} = \mathbf{0}$:

a.

$$\begin{aligned} 10x_1 - x_2 &= 9 \\ -x_1 + 10x_2 - 2x_3 &= 7 \\ -2x_2 + 10x_3 &= 6 \end{aligned}$$

b.

$$\begin{aligned} 10x_1 + 5x_2 &= 6 \\ 5x_1 + 10x_2 - 4x_3 &= 25 \\ -4x_2 + 8x_3 - x_4 &= -11 \\ -x_3 + 5x_4 &= -11 \end{aligned}$$

2. Repeat Exercise 1 using the conjugate gradient method.

3. a. Show that an A-orthogonal set of nonzero vectors associated with a positive definite matrix is linearly independent.

b. Show that if $\left\{\mathbf{v}^{(1)}, \mathbf{v}^{(2)}, \cdots, \mathbf{v}^{(n)}\right\}$ is a set of A-orthogonal nonzero vectors in R^n and $\mathbf{z}^t\mathbf{v}^{(i)} = 0$, for each $i = 1, 2, \cdots, n$, then $\mathbf{z} = \mathbf{0}$.