Homework #10: Sections 5.1, 5.2 (Week #12)
APPM 3310, Matrix Methods, Fall 2015
Due Wednesday November 18

1. Complete the following problems from the textbook:
   - Section 5.1: 2ab, 5b, 15, 16, 21
   - Section 5.2: 2a, 7b

2. Let \( x = (x_1, x_2, ... x_n)^T \) be a vector containing the weights (in pounds) of \( n \) individuals; similarly, let \( y = (y_1, y_2, ... y_n)^T \) be the vector containing the heights (inches) of the same \( n \) individuals. Suppose that a group of \( n = 5 \) individuals were sampled from a population, and each individual had their height and weight recorded:
   
   \[
   x = \begin{pmatrix} 67 \\ 72 \\ 66 \\ 72 \\ 71 \end{pmatrix} \quad \text{and} \quad y = \begin{pmatrix} 154 \\ 173 \\ 154 \\ 184 \\ 184 \end{pmatrix}.
   
   Assume that the true relationship between \( x \) and \( y \) is linear; that is, assume that
   
   \[ y_i = \beta_0 + \beta_1 x_i, \quad i = 1, ..., 5. \]

   (a) Write the general linear relationship between \( x \) and \( y \) in matrix vector form. (HINT: the “design matrix”, \( X \), will be \( 5 \times 2 \). Call the vector containing the slope and intercept parameters \( \beta = (\beta_0, \beta_1)^T \).)
   
   (b) Find the least squares estimate for \( \beta = (\beta_0, \beta_1)^T \).
   
   (c) What does this estimate represent?