HW 1 Solutions

1.
   a. Because there are 4 control points, this needs to be a 3rd degree polynomial (or cubic splines). C^1 continuity.
   b. Same reasoning as above with 6 control points, so 5th degree polynomial. Gives C^2 continuity.
2. Dot product is distributive. So a(b – alpha*a) = |a|(|b|cos e – alpha*|a|)
   a. General case: alpha = ab/|a|.
   b. |a| = 0, then any value of alpha works
   c. |a| = 1, then alpha = ab.
3. f_(AUB) = min(f_A, f_B);
   f_(AnB) = max(f_A, f_B);
   f_A_complement = –f_A
4. Let's order the points as follows: A(1,-1), B(1, -3), C(4, -1)
   a. Use the constraints alpha*A + beta*B + gamma*C = P, and alpha + beta + gamma = 1;
   b. (2,2) : (alpha, beta, gamma) = (13/6, -3/2, 1/3)
   c. (2,2) : (alpha, beta, gamma) = (8/3, -2, 1/3)
   d. It's outside because alpha, beta, gamma all need to be within the range (0,1).
5.
   a. $\begin{matrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix}$

   b. $\begin{matrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix}$

   c. $\begin{matrix} 1/2 & -1/2 & 0 \\ 1/2 & 1/2 & 0 \\ 0 & 0 & 1 \end{matrix}$ (rotation and scale)