**Instructions**: Show all work.  Use exact answers unless otherwise asked to round.

1. Consider the set of polynomials $\{1, t + t^2, 3 - t^2 + 2t^3, -4t - t^3\}$.  Does this set form a basis of $P_3$?  In other words, does the set span $P_3$ and is the set linearly independent?  Does it satisfy the definition of a subspace?  [Hint: treat the coefficients of each term as entries in the $4 \times 1$ vector.]

2. Find the kernel and the column space of the matrix $A = \begin{bmatrix} 4 & -5 & 2 & 3 & 0 \\ 1 & 1 & 0 & 1 & 0 \end{bmatrix}$.