Name: Date: 2/27/2018

M20580 L.A. and D.E. Tutorial
Worksheet 6
Sections 4.3–4.6

1. Let $\mathcal{B} = \{(1,1,0),(1,0,1),(0,1,1)\}$. Show that $\mathcal{B}$ is a basis and find the coordinates of the vector $\vec{v} = (a,b,c)$ with respect to $\mathcal{B}$.

Name: Date: 2/27/2018

2. Let $\mathbb{P}_3$ be the set of all polynomials of degree at most 3. We know $\mathbb{P}_3$ is a vector space and $\mathcal{B}_1 = \{1, t, t^2, t^3\}$ is the standard basis for $\mathbb{P}_3$.

   (a) Find the coordinates of $3t^2 + t - 1$ relative to the basis $\mathcal{B}_1$.

   (b) Let $\mathcal{B}_2 = \{1, 1 + t, t + t^2, t^2 + t^3\}$. Show that $\mathcal{B}_2$ is a basis for $\mathbb{P}_3$.

   (c) Find the coordinates of $3t^2 + t - 1$ relative to the new basis $\mathcal{B}_2$.

Name: Date: 2/27/2018

3. Let $C[-\pi, \pi]$ be the vector space of all real-valued continuous functions on $[-\pi, \pi]$. Show that the set of all solutions of the differential equation $y'' + 25y = 0$ is a subspace of $C[-\pi, \pi]$.

4. Let W be the subset of all polynomials $\mathbf{p}(t)$ in $\mathbb{P}_3$ such that $\mathbf{p}(1) = \mathbf{p}(0)$. Is W a subspace of $\mathbb{P}_3$? If the answer is yes, what is the dimension of W?