Math 33 ***Quiz*** ***March 16, 2018***

1. Determine if each of the following transformations T are linear transformations:

   i) Let g be some nonzero continuous function defined over $[a,b]$. Define $T : C^0[a,b] \to R$ by $T(f) = \int_a^b \frac{f(x)}{g(x)} dx$

   ii) Let $T : P_2 \to P_2$ be defined by $T(a_0 + a_1 x) = a_0 + (a_1 + 1)x$

2. Define $T : P_3 \to P_3$ by $T\left(a_0 + a_1x + a_2x^2\right) = \left(a_0 + a_2\right) + \left(2a_2 - a_0\right)x^2$. Determine each of the following:

i) $Ker(T)$ ii) $\dim(Rng(T))$ iii) $Rng(T)$

3. Let $T : P_3 \to C^0[a,b]$ be defined by $T(f) = f''$. Determine $Ker(T)$. Is T onto?

4. Let $\bar{u}$ be a fixed vector in $\mathbb{R}^3$. If $T : \mathbb{R}^3 \to \mathbb{R}$ is defined by $T(\bar{v}) = \langle \bar{u}, \bar{v} \rangle$. Describe in words what $Ker(T)$ represents.