Math 33 ***Quiz 11*** ***October 12, 2018***

Provide a clear and organized presentation and justify your answers. Consider the linear transformation $T : M_3(\mathbb{R}) \to P_5$ defined by:

$$T\left(\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}\right) = \left(a_{11} + a_{12} - a_{13}\right) + \left(a_{21} - a_{22} + a_{23}\right)x + a_{33}x^2 + \left(a_{32} - a_{31}\right)x^3 + \pi\left(a_{21} - a_{22} + a_{23}\right)x^4 + \left(a_{11} + a_{12} + a_{13}\right)x^5$$

1. Determine $Ker(T)$

2. Is T 1-1?

3. Determine $Rng(T)$

4. Is T onto?