Reading: Sections 2.1, 2.2, 2.3. In 2.3, ignore the section on Applications. There will be more 2.3 problems on Homework 5.

- **Section 2.1**: 14(c), 15, 17, 21, 28 (Optional: 16, 20, 37, 39, AP1, AP2)
- **Section 2.2**: 1, 5(b)(d)(f), 8, 13, 14, 16 (Optional: 5(a)(c)(e)(g), 10)
- **Section 2.3**: 1, 3, 11

**Hint for 2.2.14**: Apply your equality to the vectors $x, x^2, \cdots, x^n$ respectively

**Hint for 2.2.16**: This is similar in spirit to the proof of the rank-nullity theorem. Let $\{v_1, \cdots, v_m\}$ be a basis for $N(T)$, and extend this to a basis $\beta = \{v_1, \cdots, v_m, v_{m+1}, \cdots, v_n\}$ for $V$. Consider $\{T(v_{m+1}), \cdots, T(v_n)\}$ (shown in class to be a basis for $R(T)$), and extend this to a basis $\gamma = \{w_1, \cdots, w_m, T(v_{m+1}), \cdots, T(v_n)\}$ of $W$. Now calculate $[T]_{\gamma}^\beta$.

**Additional Problem 1**: Define $T : \mathbb{R}^2 \to \mathbb{R}$ by $T(x, y) = 3\sqrt{x^3 + y^3}$. Show that $T(cu) = cT(u)$ but $T$ is not linear

**Additional Problem 2**: Suppose $v_1, \cdots, v_n$ are fixed vectors in $V$, and define $T : \mathbb{R}^n \to V$:

$$T(a_1, \cdots, a_n) = a_1v_1 + \cdots + a_nv_n$$

(a) Show $T$ is one-to-one if and only if $\{v_1, \cdots, v_n\}$ is linearly independent

(b) Show $T$ is onto $V$ if and only if $\{v_1, \cdots, v_n\}$ spans $V$