ECE 563: Homework 6 - Due December 8th, before noon, 2022

**Problem 1:** Suppose that $Q(X)$ is a quantizer for a random variable $X$ whose codebook satisfied the centroid condition. Show that in this case, a) $E[Q(X)] = E[X]$, b) $E[Q(X)(Q(X) - X)] = 0$.

**Problem 2:** Cover and Thomas, 10.1 One-bit quantization of a single Gaussian RV.

**Problem 3:** Cover and Thomas, 10.3 Rate distortion for binary source with asymmetric distortion. Hint: Use Lagrange multipliers and only report the defining equations for the multipliers, as there is no closed form solution.

**Problem 4:** Cover and Thomas, 10.8 Bounds on the rate distortion function for squared-error distortion.

**Problem 5:** Cover and Thomas, 11.1 Chernoff-Stein lemma.