Math 224 **Fall 2017**
Homework 5 **Drew Armstrong**

Problems from 9th edition of *Probability and Statistical Inference* by Hogg, Tanis and Zimmerman:

- Section 3.1, Exercises 3, 10.
- Section 3.3, Exercises 2, 3, 10, 11.
- Section 5.6, Exercises 2, 4.
- Section 5.7, Exerciese 4, 14.

Additional Problems.

1. The Normal Curve. Let $\mu, \sigma^2 \in \mathbb{R}$ be any real numbers (with $\sigma^2 > 0$) and consider the graph of the function

$$n(x) = \frac{1}{\sqrt{2\pi\sigma^2}}\, e^{-(x-\mu)^2/2\sigma^2}.$$

(a) Compute the first derivative $n'(x)$ and show that $n'(x) = 0$ implies $x = \mu$.
(b) Compute the second derivative $n''(x)$ and show that $n''(\mu) < 0$, hence the curve has a local maximum at $x = \mu$.
(c) Show that $n''(x) = 0$ implies $x = \mu + \sigma$ or $x = \mu - \sigma$, hence the curve has inflections at these points. [The existence of inflections at $\mu + \sigma$ and $\mu - \sigma$ was de Moivre's original motivation for defining the standard deviation.]