- (4 pts.) 1. The Sundance Film Festival is held every January in Park City, Utah. Individuals from the film community determine various awards for independent film makers, and audience awards are also presented. In 2012, approximately 17% of the feature films in the documentary category were directed by women. Suppose a sample of 15 documentary films are selected at random.
- (1 pt.) a) What is the probability that exactly three films were directed by women?
- (1 pt.) b) What is the probability that at least two films were directed by women?
- (1 pt.) c) What is the mean of the number of films directed by women?
- (1 pt.) d) What is the standard deviation of the number of files directed by women?
- (4 pts.) 2. Bad weather is to blame for some of the worst highway crashes in Canada. In December 2012 there was a 27-vehicle pile-up on Highway 40, and in February 2013 a 50car pile-up shut down Highway 401 near Woodstock, Ontario. Highway 63 in Alberta has a notorious reputation; there are approximately four accidents every week on this road. Suppose a week is randomly selected.
- (1 pt.) a) Suppose a week is randomly selected, what is the probability that there are exactly 3 accidents in the week?
- (1 pt.) b) Suppose one month (exactly four weeks) is randomly selected. What is the expected number of accidents in this time period?
- (1 pt.) c) What is the standard deviation of the number of accidents in one month?
- (1 pt.) d) What is the probability that there are exactly 13 accidents in one month?
- (6 pts.) 3. Determine if each of the following functions are legitimate density curves. Please graph or sketch each one.
- (1.5 pts.) a. $f(x) = 2e^{-3x}$ for x > 0.
- (1.5 pts.) b. $f(x) = \frac{3}{152}(x + 2x^2)$ for 0 < x < 4(1.5 pts.) c. $f(x) = \frac{8}{3}(1 x^2)$ for 0 < x < 1.5(1.5 pts.) d. $f(x) = \frac{1}{x^2}$ for x>1

- (1.5 pts.) 4. The following function is a density function where k is a constant: $f(x) = k(x^3 1)$ for 1 < x < 4.
- (1 pt.) a) What is the value of k?
- (0.5 pts.) b) Sketch this function.
- (5.5 pts.) 5. The following function is a legitimate density function: $f(x) = \frac{6-x}{6} 2 < x < 4$ and 0 else.
- (1 pt.) a) Find $P(1 \le x < 3)$.
- (1 pt.) b) What is the expected value?
- (1 pt.) c) Determine the cdf.
- (1 pt.) d) Find the median.
- (1 pt.) e) Find the variance.
- (0.5 pts.) f) Find the standard deviation.

- (3 pts.) 6. From my anecdotal information (asking graduate students in statistics), the average rent for a 1-bedroom apartment in Lafayette is \$500 with a standard deviation of \$40. A one-bedroom apartment in Lafayette is selected at random.
- (1 pt.) a) Find the probability that the rent is more than \$550.
- (1 pt.) b) Find the probability that the rent is between \$438 and \$510.
- (1 pt.) c) Find the rent such that 80% of all rents are less than that rent.
- (3 pts.) 7. The President of the United States gives a State of the Union Address every year in late January or early February. Since Lyndon Johnson's address in 1966, Richard Nixon gave some of the shortest messages, and Bill Clinton presented a 1-hour and 28-minute address in 2000. The mean length for these addresses is 51.75 minutes and the standard deviation is 14.37 minutes. Assume the length of a State of the Union Address is normally distributed.
- (1 pt.) a) What is the probability that the next State of the Union Address will be less than 45 minutes long?
- (1 pt.) b) What length will be in the top 5% of all State of the Union Addresses?
- (1 pt.) c) What is the symmetric interval about the mean such that 55% of all State of the Union Addresses lie in the interval.
- (2 pts.) 8. Many companies are researching ways in which drones could help improve their business. For example, Amazon could use drones to deliver packages more quickly and pizza could be delivered to your door faster and hotter. Despite the many possibilities, results from a Pew Research Center poll indicated that 63% of Americans believe that personal and commercial drones should not be allowed in U.S. airspace. Suppose 30 Americans are selected at random.
- (1 pt.) a) The sample size (n = 30) is relatively small in this example. Explain why the normal approximation to the binomial distribution is appropriate.
- (1 pt.) b) Find the approximate probability that at most 18 Americans believe drones should not be allowed in U.S. airspace.. Remember the continuity correction.