CS 3130 / ECE 3530: Probability and Statistics for Engineers **Due Th 10/5**

Homework 4: Continuous Random Variables

Instructions: Submit a single R Markdown file (.Rmd) of your work on Canvas by 11:59pm on the due date. You may also submit diagrams, drawings, etc. as image files (.png, .jpg, .gif)—they must be formatted into your .Rmd document (we won't look at them separately). **Be sure to show all the work involved in deriving your answers! If you just give a final answer without explanation, you may not receive credit for that question.**

You may discuss the concepts with your classmates, but write up the answers entirely on your own. Do not look at another student's answers, and do not show your answers to anyone.

1. You are a professor teaching a class in probability and statistics. Over the years, you have found that homework grades tend to follow a Gaussian distribution with mean of 85 and standard deviation of 5. Answer each of the following questions using R (looking for an R command and its outputt).

   (a) What is the probability that a student's homework will be greater than 90?

   (b) What is the 95th percentile of homework grades?

   (c) What is the probability that a student gets a C on a homework (between 70 and 80)?

2. Exercise 5.7. Show your steps (i.e., what you are integrating or differentiating).

3. You are writing a server application that will receive data from a user over the internet, do some processing, and then return a result. You expect that the time between user requests will follow an exponential distribution with some rate λ (in requests per minute). If it takes your application 1 minute to process a request, what is the maximum request rate λ that you can handle if you want the probability that a user will have to wait to be no more than 10%.

4. Give a formula for the median of the Pareto distribution $Par(\alpha)$. *Hint:* Your formula should be a function of α, and you can check your answer with Exercise 5.12 for $\alpha = 1$ (answer for 5.12 is in the back of the book).