Math 350: HW#1
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1. Read Section $\geq$ Decimal Machine Numbers. Read Section 1.3.

2. 1.2: 19, 20, 21

3. 1.3: 2a-d, 6a-c, 7a-b.

4. Basic Probability and Numerical Simulation (light warmup exercises for the course):

   (a) **The Monty Hall Problem:** "Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, which has a goat. He then says to you, "Do you want to pick door No. 2?" Is it to your advantage to switch your choice?"
   Calculate the probability if you choose a strategy where you always switch. Do the same for if you always stay with your initial choice. Is it feasible to always stay or to always switch?

   (b) Write a simulation in Matlab for the Monty Hall problem using 10 million runs for the case where you always switch. What is the result? Does it agree with your calculation of the theoretical probability?
   You may want to start the code with the following:
   `car_door = randi([1 3],N,1); choice_door = randi([1 3],N,1);` and see when the choice door equals the car door and when it doesn't.

   (c) **The Birthday Problem:**
   Let n be the be the number of randomly chosen people. What is the probability that some pair of people in this group will have the same birthday? For the birthday problem, calculate the probability if $n = 5, 10, 23, 70$. What number of people is needed to reach 99.99% probability? How's about 100%? Keep this question in mind when attending any social events and pose it as a conversation stimulator.

   (d) Can you write a simulation for the Birthday Problem using Matlab?
   You may want to start by using the following code:
   `a = randi([1 365], N_runs, n_peep);`
   where `N_runs` denotes the number of trials and `n_peep` denotes the number of people in the room. You may need to use the "sort" and "diff" functions in matlab.

5. Calculate an approximation to the number $e = 2.718281828459\ldots$ using the N-th order Taylor polynomial up to accuracy 10^{-7}. What N is needed? What N is needed for the error bound obtained from Taylor's Theorem to hold to 10^{-7}? Explain the disparity if one exists.

6. 2.1: 6a,c, 7a,b, 9a,b, 13, 14, 16, 17.

7. 2.2: 3, 5, 7, 10, 11a,b,e, 13, 22.

8. 2.3: 2, 3, 11, 14, 15, 17, 25, 27, 31.

9. 2.4: 5, 6, 8, 9, 10, 11, 13.