Homework 4

- **Section 4, submit by 10:00 AM April 23**
  https://forms.gle/YxfN6jRPgmcgJKUXA
- **Section 3, submit by 1:00 PM April 23**
  https://forms.gle/gJwRy4XbnqQaLZDf8
- **You need to sign in with your Gmail account to receive your score.**

Problem	Points	Score
1	4	
2	3	
Total:	7	

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1. An accountant wants to simplify his bookkeeping by rounding amounts to the nearest integer, for example, rounding \$99.53 and \$100.46 both to \$100. What is the cumulative effect of this if there are, say, 100 amounts? To study this we model the rounding errors by 100 independent $U(-0.5, 0.5)$ random variables $X_1, X_2, \cdots, X_{100}$.
   (a) (2 points) Compute the expectation and the variance of the X_i.
   (b) (2 points) Use Chebyshev's inequality to compute an upper bound for the probability $P(|X_1 + X_2 + \cdots + X_{100}| > 10)$ that the cumulative rounding error $X_1 + X_2 + \cdots + X_{100}$ exceeds \$10.

2. (3 points) Let $X_1, X_2, \cdots, X_{625}$ be independent identically distributed random variables, with probability density function f given by

$$f(x) = \begin{cases} 3(1-x)^2 \text{ for } 0 \leq x \leq 1 \\ 0 \text{ otherwise} \end{cases}$$

   Use the central limit theorem to approximate $P(X_1 + X_2 + \cdots + X_{625} < 170)$.