Show all of your work. Please staple in the upper left hand corner.

- 1. Chapter 6 End of chapter exercises: Problem 6
- 2. Chapter 6 End of chapter exercises: Problem 13 (a-d)
- 3. Chapter 6 End of chapter exercises: Problem 27
- 4. You have a coin that has a probability of p of landing on heads. Your friend told you that they didn't think it was a fair coin so you decide you want to run a test. Your testing procedure to test  $H_0: p = 0.5$  against  $H_a: p \neq 0$  is as follows:
  - Flip the coin 7 times and count how many heads there are (call this number X)
  - If X = 0 or if X = 7 reject  $H_0$ , otherwise fail to reject  $H_0$ .

Answer the following questions:

- (a) What is the type I error rate for this testing procedure?
- (b) If in actuality the coin is such that p = .75 what is the type II error rate for this testing procedure?
- (c) If you change the rejection criteria to: If X is either 0, 1, 6, or 7 then reject  $H_0$ , otherwise fail to reject
  - i. What is the type I error rate now?
  - ii. What is the type II error rate (assuming p = .75)?
- (d) By changing the value for n and the rejection region find a test such that the type I error rate is less than .1 and the type II error rate is less than .5 (assume p = .75 when calculating the type II error rate)
- (e) Bonus: You have a biased coin such that p is not equal to 0, 0.5, or 1. Can you come up with a procedure for using that coin to generate outcomes from a Binomial(n = 1, p = .5) random variable? (Essentially can you find a way to remove the bias from a weighted coin)

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