

# MSAI Probability Seminar 11 Practice Problems

**Problem 1.** Find the MGF function of  $\Gamma(n, \lambda)$ .

**Problem 2.** While running errands, you need to go to the bank, then to the post office. Let  $X \sim \text{Gamma}(a, \lambda)$  be your waiting time in line at the bank, and let  $Y \sim \text{Gamma}(b, \lambda)$  be your waiting time in line at the post office (with the same  $\lambda$  for both). Assume  $X$  and  $Y$  are independent. What is the joint distribution of  $T = X + Y$  (your total wait at the bank and post office) and  $W = X/(X + Y)$  (the fraction of your waiting time spent at the bank)? In case of trouble, refer to the textbook, this problem is solved there.

**Problem 3.** Use the result of previous problem to find the expectation and variance of Beta distribution. In case of trouble, refer to the textbook, this problem is solved there.