Homework Set 10

DUE: MAY 4, 2020 (VIA BLACKBOARD BY 11:00AM)

To be handed in:

Please write your solution to Problems 1 and 2 on a single sheet of paper!

1. Choose real numbers X and Y uniformly and independently in $[0,1]$. What is the probability that the quadratic equation $a^2 + Xa + Y = 0$ has two distinct real solutions a_1 and a_2?
   Hint: Draw a picture in the XY-plane.

2. Let X and Y again be uniformly distributed independent random variables on $[0,1]$.

   a) Compute the expected value $E(XY)$.

   b) What is the probability density function $f_Z(z)$ of $Z = XY$?
   Hint: First compute the cumulative distribution function $F_Z(z) = P(Z \leq z)$ using a double integral, and then differentiate in z.

   c) Use your answer to b) to compute $E(Z)$. Compare it with your answer to a).