Problem 1

Find the expected value of a random variable whose probability density function is $f(x) = c\sqrt{x}\mathbf{1}_{0\leq x\leq 1}$ for some constant c.

$f_X(x)$

x
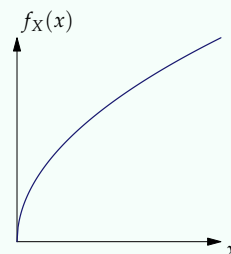
Problem 2

Find the PDF of the distribution of X if the joint distribution of X and Y is $f_{X,Y}(x,y) = e^{-x-y}\mathbf{1}_{x\geq 0}\mathbf{1}_{y\geq 0}$.

Problem 3

Suppose that T is the triangle with vertices at the origin, $(0,1)$, and $(1,0)$. Suppose that X and Y have joint density function proportional to xy on T (and zero elsewhere). Find the conditional density of Y given X. Are X and Y independent?

Problem 4

Find the expectation of XY, where X and Y are random variables whose joint distribution is uniform on the set of points which are in the unit disk and between the positive x-axis and the ray $\theta = \pi/4$.

Problem 5

Write an expression for the probability of getting exactly k heads when flipping a p-coin n times. (Note: a p-coin is a coin with probability p of turning up heads on any given flip.)

Plot the resulting expression for a variety of values of n, k, and p.