Problem # 3 (30) On Treasure Island, the two pirates, Captain Hook and Captain Crook, decide to split their gold and retire. Hook, a gambling addict, proposes a fair but random partition in two parts: Let Hook's share be X, a random variable uniformly distributed in $[0, 1]$, while Crook gets the remaining portion $Y = 1 - X$.

a) What is the correlation and covariance of Hook's and Crook's shares?

b) What is their correlation coefficient, $\rho_{X,Y}$?

c) Whether or not this ends in a fight depends on the size of the smaller share... What is the *expected* size of the smaller share (regardless of who gets it)?