August 31

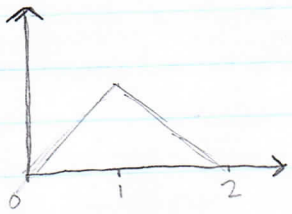
Note: Rule of thumb: When you're working with a sum of independent random variables, try to work with the MGF. Often clarifies things.

Let's talk about the sum of ind. unif. RVs.

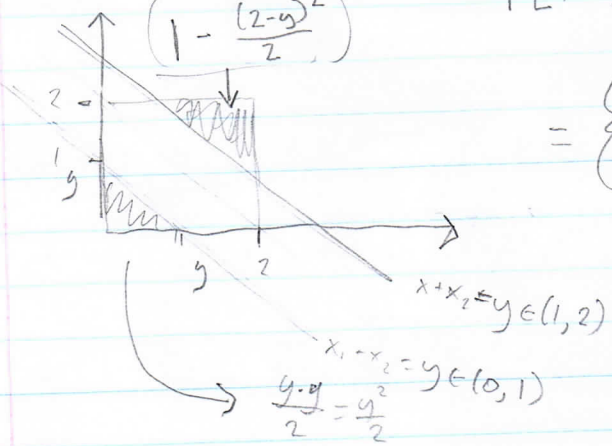
Consider $X_1, X_2 \sim UNIF(0,1)$ with $X_1 \perp X_2$.

$Y = X_1 + X_2$

Note the support of Y is $(0, 2)$



$$f(y) = \begin{cases} y & y \in (0,1) \\ 2-y & y \in (1,2) \end{cases}$$



$$P[Y \le y] = P[X_1 + X_2 \le y]$$

$$= \begin{cases} \frac{y^2}{2} \end{cases}$$

$$f(y) = \frac{\partial}{\partial y} P[Y \le y] = \frac{\partial}{\partial y} F(y)$$

$$f(y) = \begin{cases} y & y \in (0,1) \\ 2-y & y \in (1,2) \end{cases}$$

$$P[Y \ge 1] = 1 - P[Y < 1]$$