

### [nex10] Random inkjet printer

A number  $N$  of black inkdots, all with area  $A_D$ , are printed randomly on a sheet of paper with area  $A_S$ . Assume that  $N$  and  $A_S$  are sufficiently large, so that edge effects can be neglected.

- (a) Calculate the average blackened area  $\langle A_B \rangle$  on the sheet as a function of  $N$ ,  $A_D$ , and  $A_S$ .
- (b) Show that for very large  $N$  and finite  $NA_D/A_S$  the asymptotic expression,

$$\langle A_B \rangle \rightsquigarrow A_S \left[ 1 - e^{-NA_D/A_S} \right],$$

ensues, telling us that some white area is likely to persist in the face of a multitudes of random inkdots.

**Solution:**