STAT 131
12 May 20
(DD office
1.5 hour
session)

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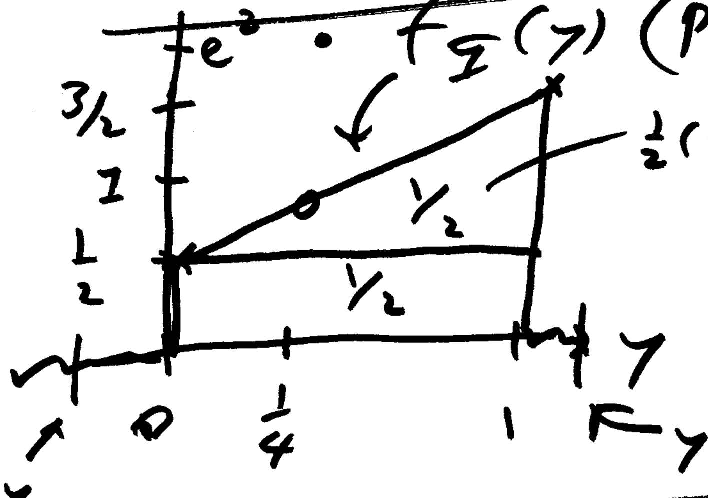
$$f_Y(y) = \begin{cases} \frac{1}{2}(2y+1) & \text{for } 0 \le y \le 1 \\ 0 & \text{else} \end{cases}$$

($Y$ continuous)




$$\int_0^1 \frac{2y+1}{2}\,dy = 1 \checkmark$$

$$S_Y = [0, 1]$$

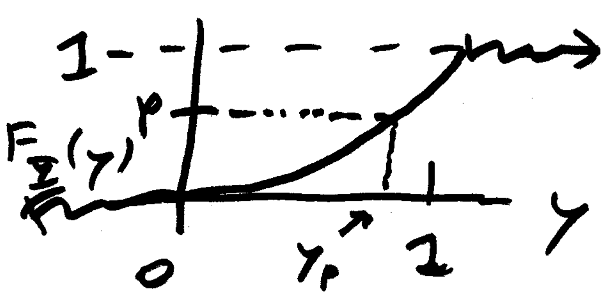
$$F_Y(y) = P(Y \le y) = \begin{cases} 0 & \text{for } y \le 0 \\ \frac{y^2+y}{2} & 0 \le y \le 1 \\ 1 & y \ge 1 \end{cases}$$

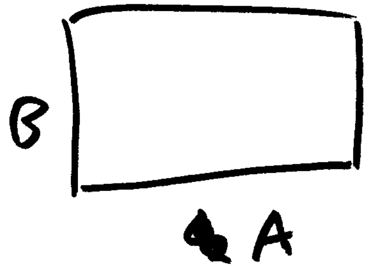
(CDF)

for $0 \le y \le 1$ $\quad F_Y(y) = \int_0^y f_Y(t)\,dt$

$$p = \frac{y_p^2 + y_p}{2} = \frac{(t+\frac{1}{2})^2}{2}\Bigg|_0^y = \int_0^y \cancel{2}(t+\tfrac{1}{2})\,dt$$

solve for $y_p$






area $= AB$

perimeter $= 2(A+B)$

find $(A, B)$ to minimize perimeter subject to fixed area

solutions

$$\underline{\underline{y_p}} = \begin{cases} \cancel{\frac{1}{2}\left(-\sqrt{8p+1}-1\right)} \\ \frac{1}{2}\left(+\sqrt{8\underline{\underline{p}}+1}-1\right) \end{cases}$$

IPIT: generate $U_1^*, \ldots, U_n^* \overset{IID}{\sim}$ $\underline{\text{uniform}(0,1)}$

$U_i^*$

and compute $Y_i^* = \frac{1}{2}\left(\sqrt{8U_i^*+1}-1\right)$

$\overset{IID}{\sim} f_Y(y)$

THT 2 # 4(a)

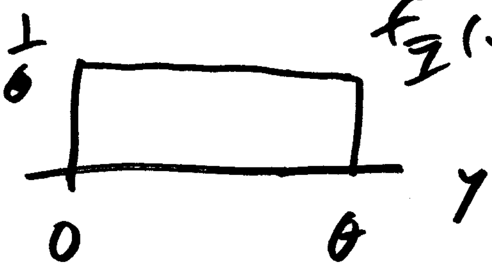
$(\theta > 0)$

$$(Y_i \mid \theta) \overset{IID}{\sim} \text{Uniform}(0, \theta) \quad (i = 1, \dots, n)$$

$\boldsymbol{y} = (y_1, \dots, y_n)$

$\boldsymbol{Y} = (Y_1, \dots, Y_n)$

PDF $f_Y(y)$




(CS)

$$f_{Y_i}(y_i \mid \theta) = \begin{cases} \frac{1}{\theta} & \text{for } 0 \le y_i \le \theta \\ 0 & \text{else} \end{cases}$$

$$= \frac{1}{\theta} I(0 \le y_i \le \theta)$$

(math)

$p_{Y_i}(y_i \mid \theta)$

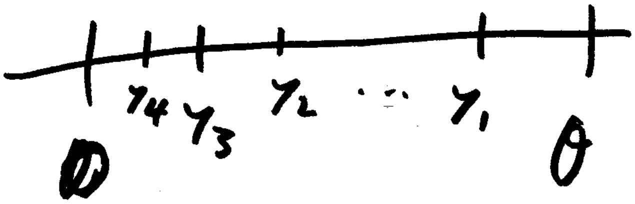
$$f_{Y_1, \dots, Y_n}(y_1, \overset{\text{and}}{\dots}, y_n \mid \theta) \overset{\text{IID}}{\underset{\text{indep.}}{=}} \prod_{i=1}^{n} f_{Y_i}(y_i \mid \theta)$$

$$= f_{Y_1}(y_1 \mid \theta) \cdot f_{Y_2}(y_2 \mid \theta) \cdots f_{Y_n}(y_n \mid \theta)$$

$$= \left[\frac{1}{\theta} I(0 \le y_1 \le \theta)\right] \cdot \left[\frac{1}{\theta} I(0 \le y_2 \le \theta)\right] \cdot$$

$$\cdots \left[\frac{1}{\theta} I(0 \le y_n \le \theta)\right]$$

$$= \frac{1}{\theta^n} \cdot \underline{I(0 \le y_1 \le \theta)} \cdot \underline{I(0 \le y_2 \le \theta)} \cdot \ldots \cdot \underline{I(0 \le y_n \le \theta)}$$

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$$= \frac{1}{\theta^n} I\left(0 \le \text{all } y_i \le \theta\right)$$

$$\Updownarrow$$

$$= \frac{1}{\theta^n} I\left(0 \le \underbrace{\max(y_i)}_{m} \le \theta\right)$$

$$f_{\underset{\sim}{Y}}(y \mid \theta) = \frac{1}{\theta^n} I\left((0 \le m \le \theta\right)$$