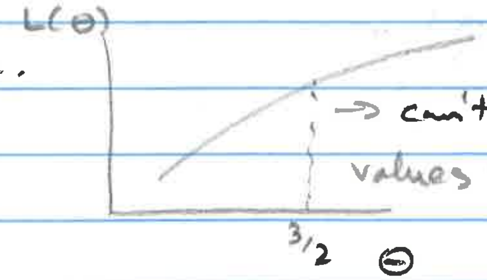
So to maximize $L(\theta)$, choose the largest possible value for $\hat{\theta} = 3/2$

If $\bar{y} > 3/2$ . . .



→ can't pick any of those values for $\hat{\theta}$

λ will now be a piecewise fct . . .

$$\lambda = \begin{cases} \dfrac{\dfrac{e^{-n(3/2)}(3/2)^{\Sigma y_i}}{\prod_{i=1}^{n} y_i!}}{\dfrac{e^{-n\bar{y}}(\bar{y})^{\Sigma y_i}}{\prod_{i=1}^{n} y_i!}}, & \text{if } \bar{y} < 3/2 \\ 1, & \text{if } \bar{y} \geq 3/2 \end{cases}$$

→ note: This tells us if $\bar{y} \geq 3/2$, there is no reason to conclude $\theta < 3/2$

We concern ourselves with the case $\bar{y} < 3/2$

$$\lambda = e^{-n(3/2 - \bar{y})} \cdot \left(\frac{3}{2\bar{y}}\right)^{n\bar{y}}$$

note: λ is a fct of $\bar{y}$. If we can determine if $\lambda(\bar{y})$ is increasing or decreasing when $\bar{y} < 3/2$, we can use $\bar{y}$ as a test statistic.

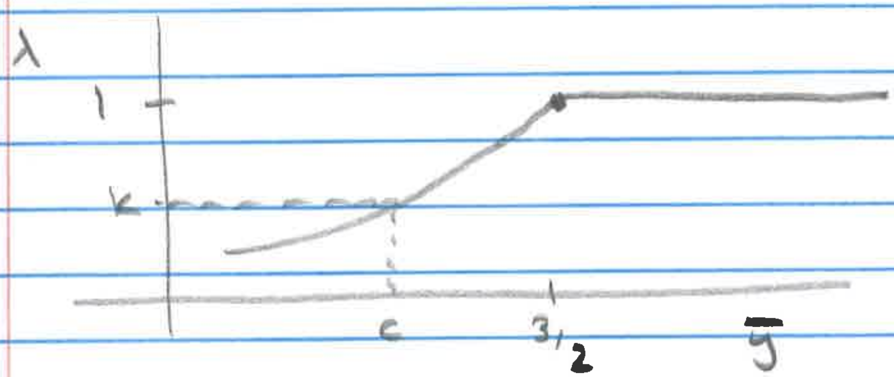
$$\ln\lambda = -n\left(\tfrac{3}{2}-\bar{y}\right) + n\bar{y}\cdot\ln\left(\frac{3}{2\bar{y}}\right)$$

$$\frac{\partial \ln\lambda}{\partial \bar{y}} = n + (n\bar{y})\cdot\frac{1}{\left(\frac{3}{2\bar{y}}\right)}\cdot\left(\frac{-3}{2\bar{y}^2}\right) + n\cdot\ln\left(\frac{3}{2\bar{y}}\right)$$

$$= n - n + n\ln\left(\frac{3}{2\bar{y}}\right)$$

$$= n\ln\left(\frac{\frac{3}{2}}{\bar{y}}\right) > 0 \quad \text{if } \bar{y} < 3/2$$

i.e. λ is an increasing fct of $\bar{y}$ when $\bar{y} < 3/2$



Reject H_0 for $\lambda \le k$ is equivalent to rejecting H_0 for $\bar{y} \le c$ or $\sum y_i \le n\cdot c$

under H_0 $\sum y_i \sim POI(n\theta)$

<u>note</u>: Since $\sum y_i$ is discrete, we may not match α exactly