Problem: E. coli cell division rate = 4 divisions/hr (~15min)

Poisson ⇒ # of divisions/hr.

PDF: $Pr[X=x] = e^{-\lambda t}\frac{(\lambda t)^x}{x!}$

$E(X) = \lambda(t) = \mu$

$= 4/hr.$

Total # of events in time t

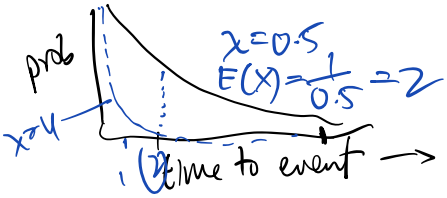
Exponential ⇒ time b/w divisions

$f(x) = Pr[X=x] = \lambda e^{-\lambda t}, x \geq 0.$

λ = "rate" (decay rate, "failure" rate, waiting time)

$\lambda = 4/hr$

$E(X) = \frac{1}{\lambda} = 0.25$



Time between events

→ d = density (PDF) $Pr[X=x]$

q = quantile $q(p,\lambda)$

→ p = total prob (CDF) $Pr[X \leq x]$ $Pr[X>x]$

r = random sample.

$Pr[x_1 < X < x_2]$

λ=0.5 : P(X=2) = dexp(2, 0.5) ans 0.184

P(X≤2) = pexp(2, 0.5)

q(0.5, 0.5) = MEDIAN = 1.39 = ln2/λ

what is $P(X=4)? = e^{-4}4^4/4! = dpois(4) = 0.0183 \cdot 16/24 = 0.63$

$P(X \leq 4)? = \sum_{x=0}^{4} e^{x}\lambda^{x}/x! = ppois(4) = \sum dpois(0:4, 4)$

$P(X>4)? = \sum_{x=5}^{\infty} e^{x}\lambda^{x}/x! = ppois(4, lower.tail = F)$

$q(p=0.5, 4) = qpois(0.5, 4) = 4$

t=6? $p(x \leq 24) = ppois(24, 6\cdot 4) = 0.55$

$\mu = \lambda t = 24$ $q(p=0.5, 24) = 24$ MEDIAN