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852 HW1 - Exponential Distribution

1) $P[X > 2.0]$, $\lambda = 0.5$
$= 1 - P[X <= 2.0]$
$= 1 - (1 - e^{-0.5(2.0)})$
$= 1 - (1 - 0.36788)$
$=$ **0.36788**

2) $P[X <= 5.0]$, $\lambda = 0.5$
$= 1 - e^{-0.5(5.0)}$
$= 1 - 0.08208$
$=$ **0.91792**

3) $P[1 < X <= 3]$, $\lambda = 0.5$
$= P[X <= 3] - P[X <= 1]$
$= (1 - e^{-0.5(3)}) - (1 - e^{-0.5(1)})$
$= (1 - 0.22313) - (1 - 0.60653)$
$= 0.77687 - 0.39347$
$=$ **0.3834**

4) For the last problem, I was unsure if we should use the average value of 2 seconds on for every 5 seconds off, , or use 2/(2+5) as λ to determine to probability of the random variable being “on” at any given time.

Assuming the former:
20Mb/s * 2/(2+5) = **average 5.714Mb/s**

Assuming the latter:
on avg 2 seconds, off avg 5 seconds
over 1 second timescale, λ(on) = 2/(2+5)
for any given second (x = 1),
$P[on] = (2/7)e^{-(2/7)1}$
$P[on] = 0.21471$
If on state = 20Mb/s,
20Mb/s * 0.21471 = **average 4.294Mb/s**