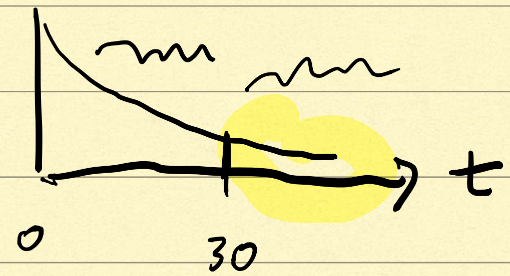
PS 4 A)



$$\rho_T(t) = \frac{1}{\tau} e^{-t/\tau}$$

$$F_T(t) = 1 - e^{-t/\tau} = \mathbb{P}(T < t)$$

$$\frac{E[T_{wait} \cap T > 30]}{\cancel{\mathbb{P}(T > 30)}}$$

$$E[T_{wait}]$$

$$= E[T_{wait} \mid \text{went over}] \cdot \cancel{\mathbb{P}(\text{went over})}$$

$$+ E[T_{wait} \mid \text{not over}] \cdot \mathbb{P}(\text{not over})$$

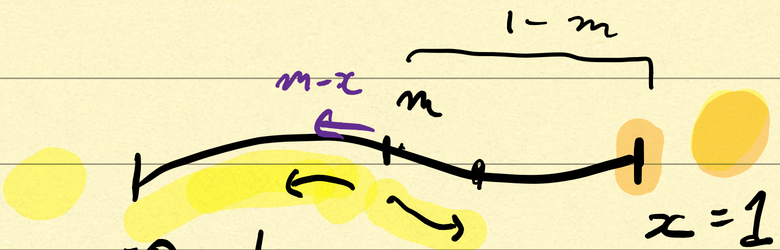
$$= \tau \cdot \mathbb{P}(T > 30\text{min})$$

$$+ 0 \cdot \mathbb{P}(T < 30\text{min})$$

$$= \tau \cdot (1 - F_T(30\text{min})) + 0$$

$$= \tau e^{-30/30} = \tau e^{-1} \approx 11 \text{ min}$$

B)



λ - units $\frac{1}{NM}$

$x=0$ $\quad$ R

$$\mathbb{P}(R=1) = \mathbb{P}(R>1)$$
$$= 1 - F_R(1-m)$$
$$= e^{-\lambda(1-m)}$$

$$\mathbb{P}(R>x) = 1 - F_R(x-m)$$
$m<x<1$
$$= e^{-\lambda(x-m)}$$

$$\mathbb{P}(\underline{L=0}) = \mathbb{P}(L<0) = 1 - F_L(m)$$
$$= 1 - 1 + e^{-\lambda m} = e^{-\lambda m}$$

$$\mathbb{P}(L<x) = 1 - F_L(m-x)$$
$$= e^{-\lambda(m-x)}$$

$E[R]$

WE EXPECT $\quad n \to \infty \quad$ $E[R] \to m$

$E[L] \to m$

$E[R-L] \to 0$

AS $\lambda \to 0$ $\quad$ $E[R] \to 1$

$E[L] \to 0$

$E[R-L] \to 1$

SUPPOSE
$n=1$

$$E[R] = E[R \mid R<1]\,\mathbb{P}(R<1) + E[R \mid R=1]\,\mathbb{P}(R=1)$$

$$= \frac{E[R \cap R<1]}{\cancel{\mathbb{P}(R<1)}}\,\cancel{\mathbb{P}(R<1)} + 1 \cdot \mathbb{P}(R=1)$$

$$= E[R \cap R<1] + \mathbb{P}(R=1)$$

$$= \int_m^1 x\, p_R(x)\, dx + e^{-\lambda(1-m)}$$

$n>1$
$E[R]$
$E[L]$