HW #11

1) $$\int_0^\infty \lambda \exp(-\lambda t)\, dt = \left[-\exp(-\lambda t)\Big|_0^\infty\right] = -\exp(-\infty) + \exp(0) = 0+1 = \boxed{1} \checkmark$$

2) $$\bar{t} = \frac{\int_0^\infty t\lambda \exp(-\lambda t)\,dt}{\underbrace{\int_0^\infty \lambda \exp(-\lambda t)\,dt}_{=1}} = \frac{\left[\cancel{-t\exp(-\lambda t)}^{\,0} + \int \exp(-\lambda t)\,dt\right]_0^\infty}{1}$$

$$\Rightarrow \frac{-\exp(-\lambda t)}{\lambda}\Big|_0^\infty = -\frac{\exp(-\infty)}{\lambda} + \frac{\exp(0)}{\lambda} = \boxed{\frac{1}{\lambda} = \bar{t}}$$

Insurance Company

payment = \$100,000 , premium = \$1000 / year

$R = pC$ if overhead is 1) 10%, 2) 20%, 3) 30% then $C =$ 1) \$909.09, 2) \$833.33, 3) \$769.23

$\therefore p = \frac{C}{R} =$
1) 0.909% death/year
2) 0.833% death/year
3) 0.769% death/year

Breakeven would have $p = \frac{C}{R} = \frac{1000}{100{,}000} = 1\%$ death/year.

p break-even > p 10% overhead > p 20% overhead > p 30% overhead

HW#11

Risk of Death / year

Event	national Deaths / year	Risk [death / person · years]
Radon	21,000	6.462e-5
Drunk Driving	17,400	5.354e-5
Falls in home	8,000	2.462e-5
Drowning	3,900	1.2e-5
Home Fires	2,800	8.615e-6

$$\text{Risk} = \frac{\text{deaths / year}}{\text{total population}}$$

Radon comes from the decay of uranium found naturally in the soil. Radon is denser than air, so it sinks in air & sits in low spots. Radon is especially dangerous in basements as the decay of uranium relases radon that seeps into the basements. This is why having radon alarms in your house is very important.