Exponential

Friday, June 23, 2023 1:12 PM

The exponential distribution has the density function

$$f(x) = \lambda e^{-\lambda x}, \quad \text{for } x \geq 0$$

and its cumulative distribution function is

$$F(x) = 1 - e^{-\lambda x}, \quad \text{for } x \geq 0$$

The expected value of the exponential distribution is $1/\lambda$ and the variance is $(1/\lambda)^2$.

If number of arrivals at a counter follow Poisson Distribution then the inter-arrival time follows Exponential Distribution

8:00	8:04	8:14	8:14	8:32	8:40	8:44	9:00	9:03

X: number of arrivals in a 15 minutes duration follows Poisson
Y:Inter-arrival time follow Exponential
0, 4, 10, 10, 18, 8, 4, 16, 3

43. The actual delivery time from a pizza delivery company is exponentially distributed with a mean of 28 minutes.

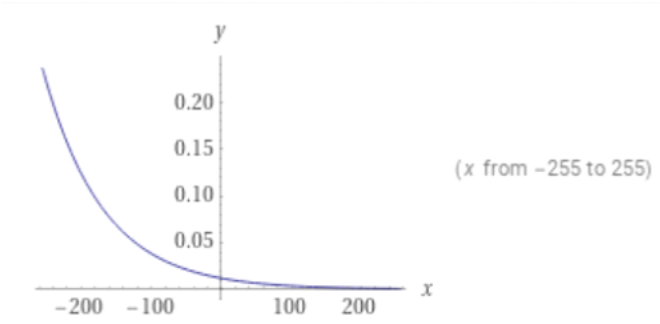
a. What is the probability that the delivery time will exceed 31 minutes?

b. What proportion of deliveries will be completed within 25 minutes?

```
expon.sf(31, loc=1/28, scale=28)
0.3309237320446033

expon.cdf(25, loc=1/28, scale=28)
0.5899932404256827
```

3. The time-of-failure of a machine follows exponential distribution with mean time between failures (MTBF) estimated to be 85 hrs. Write code to answer the following questions:
   (a) Calculate the probability that the system will fail before 85 hrs.
   (b) Calculate the probability that it will not fail up to 150 hrs.




```
expon.cdf(85, loc=1/85, scale=85)
0.6320696377349755

expon.sf(150, loc=1/85, scale=85)
0.17126084522766885
```