NATIONAL SUN YAT-SEN UNIVERSITY, DEPARTMENT OF MATHEMATICS

Reliability Analysis Assignment 2 (group)

Chia-Hsuan Chang and Kuan-I Chung

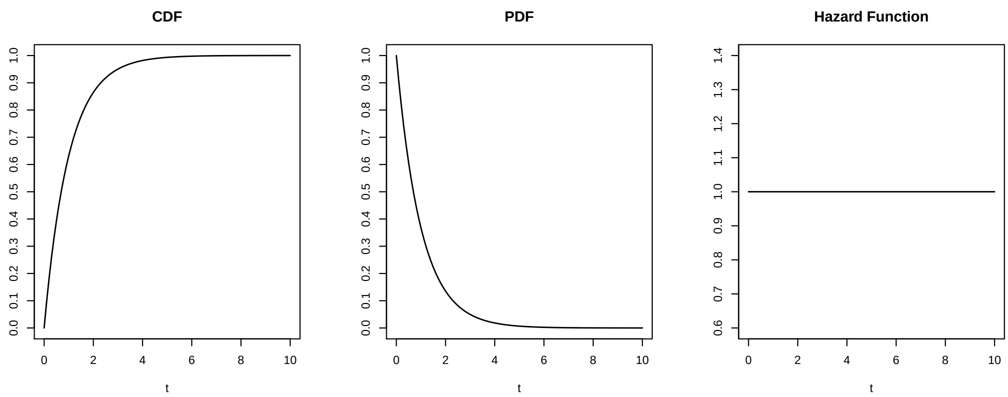
2017.03.20

2.5

(a)

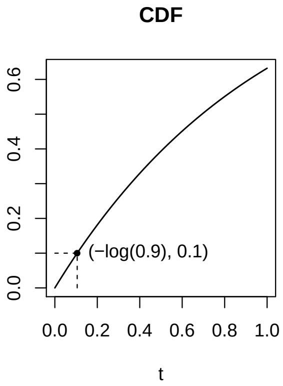
$$
\begin{aligned}
f(t) &= \frac{d}{dt}(1 - exp(t)) = exp(-t) \\
h(t) &= \frac{f(t)}{1-F(t)} = \frac{exp(-t)}{1-(1-exp(t))} = 1
\end{aligned}
$$

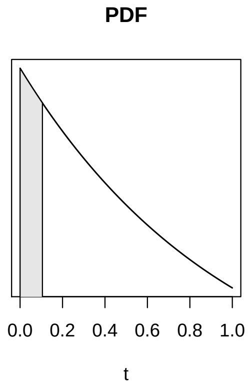
(b)



(c)

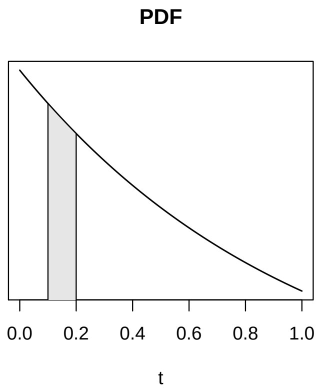
$$\begin{aligned} & F(t_p) = p = 1 - exp(-t_p) \\ \Rightarrow & exp(-t_p) = 1 - p \\ \Rightarrow & -t_p = log(1-p) \\ \Rightarrow & t_p = -log(1-p) \\ \Rightarrow & t_{.1} = -log(1-0.1) = -log(0.9) \approx 0.1054 \end{aligned}$$





(d)

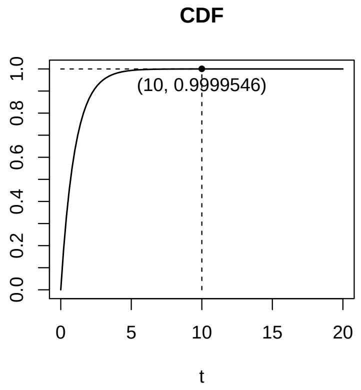
$$Pr(0.1 < T \leq 0.2) = F(0.2) - F(0.1) = exp(-0.1) - exp(-0.2) \approx 0.0861$$
$$\Rightarrow \; Pr(0.1 < T \leq 0.2 | T > 0.1) = \frac{F(0.2) - F(0.1)}{1 - F(0.1)} = \frac{exp(-0.1) - exp(-0.2)}{exp(-0.1)} \approx 0.0952$$



$h(0.1) \cdot (0.2 - 0.1) = 0.1 \approx 0.0952$

2.6

(a)



(b)

t_i	$F(t_i)$	$S(t_i)$	$\pi(t_i)$	p_i
0.1	0.0952	0.9048	0.0952	0.0952
0.2	0.1813	0.8187	0.0861	0.0952
0.5	0.3935	0.6065	0.2122	0.2592
1	0.6321	0.3679	0.2387	0.3935
2	0.8647	0.1353	0.2325	0.6321
∞	1.0000	0.0000	0.1353	1.0000

2.8

$L(p) = C\left((F(8))^0(1-F(8))^{39} \cdot (F(12)-F(8))^4\ (1-F(12))^{49} \cdots (F(44)-F(40))^{21}\ (1-F(44))^{19+21+15}\right)$

If we know the exact event time, the likelihood function will consist the term of $f(t_i)$.

2.9

(a) Because we do not know when the samples had been existing before the experiment, the failures in the interval $0-25$ days could be considered to be left-censored observation.

(b) Because we do not know when the samples would fail after the end of the experiment, the failures in the interval $100-\infty$ days could be considered to be left-censored observation.

2.10

$L(p) = C\left((F(25))^{109}\ (F(50)-F(25))^{42}\ (F(75)-F(50))^{17}\ (F(100)-F(75))^{7}\ (1-F(100))^{13}\right)$