NO.

Date.

B07129027 名重毅

1.

(a) $f_Z(z) = \frac{1}{\sqrt{2\pi}\cdot 1} e^{-\frac{z^2}{2}}$

(b) $P(-1 \le z \le 1)$ 一個標準差 $\doteq 68.2689\%$

(c) $P(-x \le z \le x) = 95\%$, $x \doteq 1.96$

(d) $f_Q(Q) = \frac{1}{\sqrt{2\pi}} e^{-\frac{Q}{2}} \frac{1}{\sqrt{2Q}}$ $Q > 0$

(e) $E[Q] = 0$

(f) $std(Q) = \sqrt{2}$

(g) $99.7 \doteq 2 \doteq 0.498$.

2.

(a) $f_T(t) = \begin{cases} e^{-x} & x > 0 \\ 0. & \text{其他} \end{cases}$

$\beta = 1$

$\sigma = 1$

(b) $E[T] = 1$

(c) $std[T] = 1$

(d) $P(T > 1)$

$\int_1^\infty e^{-t} dt = e^{-1} = 0.3679$.

(e) $f_{T_3}(t) = \begin{cases} \frac{1}{3} e^{-x/3} & x > 0 \\ 0. & \text{其他} \end{cases}$

(f) $E[T_3] = 3$

(g) $\sigma^2 = 3^2$ $\sigma = 3$ $std[T_3] = \sqrt{3}$

(h) $P(T_3 > 3) = 0.4232$

(i) $P(T_3 > 7) = 0.0296$

機率很小，可以接受

Python.

1-a,

```
import sympy as sy
pi = sy.pi
x = sy.symbols('x')
u = sy.symbols('u', real=True)
σ = sy.symbols('σ', positive=True)
fx = sy.exp(-((x-u)/σ)**2/2)/σ/sy.sqrt(2*π)
```

1-b

```
u=0
σ=1
z1=-1   #stats.norm.cdf(z1,0,1)
z2=-1
```

1-d

```
x = sy.symbols('x')
α, β = sy.symbols('α, β', positive=True)
fx = x**(α-1)*sy.exp(-x/β)/sy.gamma(α)/β**α
```

1-e

```
u = sy.integrate(x*fx,(x,0,sy.oo)).simplify()
```

1-f

```
σ² = sy.integrate((x-u)**2)*fx,(x,0,sy.oo)).simplify()
```