B0621144 徐佑宗

1. (a) $z_0\ (\mu_0, \sigma_0)$

$z_1\ (\mu_1, 0, 1)$

$z_0 + z_1\ (0, 2)$

⇒ 常態分布

$f(x;\mu,\sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$

(b) $z_0\ (\mu_0, \sigma_0)$

$z^2\ (\mu_0, \sigma_0^2) = (0, 1)$

⇒ 常態分布 $f(x;\mu,\sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$

(c) $z_1^2\ (\mu_1^2, \sigma_1^2) \Rightarrow (0, 1)$

$z_2^2\ (\mu_1^2, \sigma_2^2) \Rightarrow (0, 1)$

$z_1^2 + z_2^2\ (0, 2)$

⇒ 常態分布

$f(x;\mu,\sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$

(d)

$f(x) = \frac{x^{(\alpha-1)}\lambda^{\alpha} e^{-\lambda x}}{\Gamma(\alpha)}$

⇒ 伽瑪分布

(e) $f(t) = \frac{\Gamma\left(\frac{v+1}{2}\right)}{\sqrt{v\pi}\,\Gamma\left(\frac{v}{2}\right)} \left(1 + \frac{t^2}{v}\right)^{-\frac{(v+1)}{2}}$

$v = n-1$

⇒ t 分布

2、(a) st.norm.cdf(1, 0, 2)

⇒ 0.6914

(b) st.norm.cdf(1, 0, 1)

⇒ 0.8413

(c) st.norm.cdf(1, 0, 2)

⇒ 0.6914

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3、(a) 已知σ，以常態分布計算

```
import scipy.stats as st
μ = 65
σ = 3
x = 64
n = 25
st.norm.cdf(x = x, loc = μ, scale = σ/n**0.5)
```

$\Rightarrow$ 0.0478

(b)

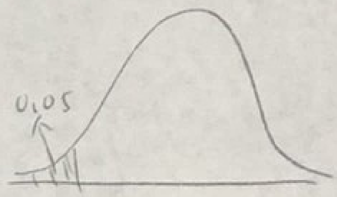
```
μ = 65
σ = 3
n = 25
xbar = 64
st.norm.cdf(x = xbar, loc = μ, scale = σ/n**0.5)
```

$\Rightarrow$ 0.0478

(c) $P(\overline{X_A} \le X) = 0.05 \Rightarrow z \doteq -1.645$

$$\frac{\overline{X_A} - X}{3/\sqrt{25}} = -1.645$$

$X = 62.2583$

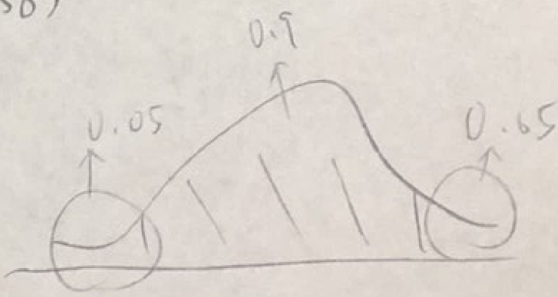


(d) 因常態分布對稱，中央面積 0.9 等同於全部面積減掉兩倍之 $P(\overline{X_A} \le X)$

而 X_1 即為 (c) 之 $X = 62.2583$

另外 $\dfrac{\overline{X_A} - X_2}{3/\sqrt{25}} = 1.645$

求出 $X_2 = 67.7417$



$\Rightarrow (X_1, X_2) = (62.2583, 67.7417)$