

HW2 Due 10/4/2022

$$P(\bar{y} \leq 11.7) \rightarrow P(Z \leq (11.7 - 12) / \frac{2}{\sqrt{100}}) \rightarrow P(Z \leq -1.5) = 0.067 \rightarrow \text{level of significance}$$

$$P(Z \leq (11.7 - 11.5) / \frac{2}{\sqrt{100}}) \rightarrow P(Z \leq 1) = 0.841 \rightarrow \text{Power of test}$$

$$P(Z < 1.28) = 0.9$$

$$\hookrightarrow \bar{y} = 11.5 + 1.28 \left( \frac{2}{\sqrt{100}} \right) = 11.756$$

$\hookrightarrow$  We would reject the  $H_0$  if the sample mean was  $\leq 11.756$  at a power of test of 0.9

$$\therefore P(Z < (11.756 - 12) / \frac{2}{\sqrt{100}}) \rightarrow P(Z < -1.22) = 1 - 0.8889 = 0.112$$

$\hookrightarrow$  level of significance

$$e) P(Z < -1.64) = 0.05$$

$$\hookrightarrow \bar{y} = 12 - 1.64 \left( \frac{2}{\sqrt{100}} \right) = 11.672 \rightarrow \text{Value of } \bar{y} \text{ at which } H_0 \text{ is rejected at SL of 0.05}$$

$$\hookrightarrow P(\bar{y} < 11.672) \rightarrow P(Z < (11.672 - 11.5) / \frac{2}{\sqrt{100}})$$

$$\hookrightarrow P(Z < 0.86) = 0.805 \rightarrow \text{Power of test}$$

$$f) P(Z < -1.64) = 0.05$$

$$\hookrightarrow \bar{y} = 12 - 1.64 \cdot \frac{2}{\sqrt{n}} = 12 - \frac{3.29}{\sqrt{n}} \rightarrow P(\bar{y} < 12 - \frac{3.29}{\sqrt{n}}) = 0.9 \rightarrow P(Z < 1.28)$$

$$\therefore P(Z < 1.28) = 0.9$$

$$\hookrightarrow 12 - \frac{3.29}{\sqrt{n}} = 11.5 + 1.28 \left( \frac{2}{\sqrt{100}} \right)$$

$$\frac{5.854}{\sqrt{n}} = 0.5$$

$$n = \left( \frac{5.854}{0.5} \right)^2$$

$n = 137.1 \rightarrow n = 138$  is the smallest sample size needed for a 5% level test with power of 0.9