5. The continuous random variable X is normally distributed with

$$X \sim \mathrm{N}(\mu, 5^2)$$

A random sample of 10 observations of X is taken and $\overline{X}$ denotes the sample mean.

(a) Show that a 90% confidence interval for μ, in terms of $\overline{x}$, is given by

$$\left(\overline{x} - 2.60, \overline{x} + 2.60\right)$$

(3)

The continuous random variable Y is normally distributed with

$$Y \sim \mathrm{N}(\mu, 3^2)$$

A random sample of 20 observations of Y are taken and $\overline{Y}$ denotes the sample mean.

(b) Find a 95% confidence interval for μ, in terms of $\overline{y}$

(3)

(c) Given that X and Y are independent,

(i) find the distribution of $\overline{X} - \overline{Y}$

(ii) calculate the probability that the two confidence intervals from part (a) and part (b) do not overlap.

(7)

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Question 5 continued

(Total for Question 5 is 13 marks)