Question 17 **(12 marks)**

A researcher is interested in estimating the population mean μ (dollars) that Perth residents had spent via online shopping in December 2020. A random sample of size n gave a sample mean of \$400, a sample standard deviation s and a 95% confidence interval of width \$200.

(a) State the 95% confidence interval obtained. (1 mark)

(b) Calculate the standard deviation of the sample mean, correct to \$0.01. (2 marks)

(c) In terms of n, what sample size would yield a 95% confidence interval of width \$50? Show your reasoning. (2 marks)

(d) A sketch of the locus of a complex number z is shown below. The upper boundary of the locus is part of a circle, centred at $z = i$. Write equations or inequalities in terms of z (without using $x = Re(z)$ or $y = Im(z)$) for the indicated locus. (4 marks)