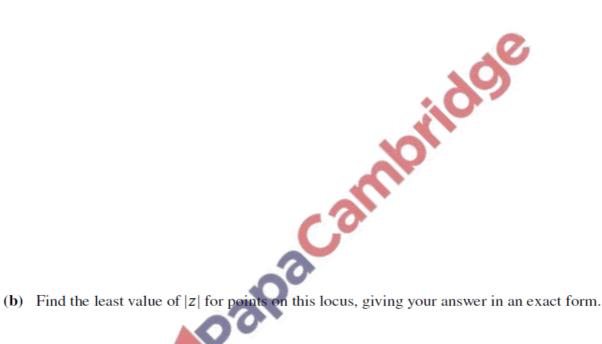# Complex Numbers – 2023 June A2 Math 9709

1. June/2023/Paper_9709/32/No.3

   (a) On an Argand diagram, sketch the locus of points representing complex numbers z satisfying $|z + 3 - 2i| = 2$. [2]

   (b) Find the least value of $|z|$ for points on this locus, giving your answer in an exact form. [2]

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The complex number $2 + yi$ is denoted by a, where y is a real number and $y < 0$. It is given that $f(a) = a^3 - a^2 - 2a$.

(a) Find a simplified expression for $f(a)$ in terms of y. [3]

(b) Given that $\text{Re}(f(a)) = -20$, find $\arg a$. [3]

3.

On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z - 3 - i| \leqslant 3$ and $|z| \geqslant |z - 4i|$. [4]

4.

The complex number z is defined by $z = \dfrac{5a - 2i}{3 + ai}$, where a is an integer. It is given that $\arg z = -\frac{1}{4}\pi$.

(a) Find the value of a and hence express z in the form $x + iy$, where x and y are real. [6]