8. The curve C in the z-plane, where $z = x + \mathrm{i}y$, has equation

$$y = \frac{1}{2}\left(x^2 - 4x + 3\right)$$

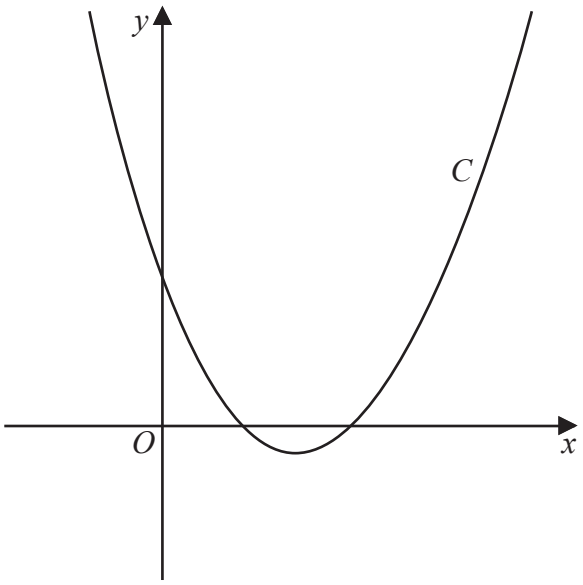


Figure 2

A sketch of the graph of C is shown in Figure 2.

Given that the line with equation $y = mx$ is a tangent to C

(a) determine the exact possible values of m.

(3)

(b) Hence determine the range of values of $\arg z$ for points on C, giving the answer in degrees.

(3)

The transformation T from the z-plane, where $z = x + \mathrm{i}y$, to the w-plane, where $w = u + \mathrm{i}v$, is given by

$$w = \mathrm{i}\left(x - 2\mathrm{i}\right)^2 + 2y - 5\mathrm{i}$$

Curve C is mapped by T onto the straight line l

(c) Determine an equation for l, giving the answer in the form $v = \mathrm{f}\left(u\right)$.

(3)

(d) Hence determine the minimum value of $|w|$ for points on l, giving the answer in the form $k\sqrt{2}$ where k is an integer.

(2)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 8 continued

Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 8 continued

Question 8 continued

(Total for Question 8 is 11 marks)

TOTAL FOR PAPER IS 75 MARKS

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA