

MA10103: Foundation Mathematics I

PROBLEM SHEET 9 – ASSESSED COURSEWORK (WORTH 12.5% OF FINAL MARK)

Please do **ALL** of the following questions. Show your working (you will get no marks for answers alone).

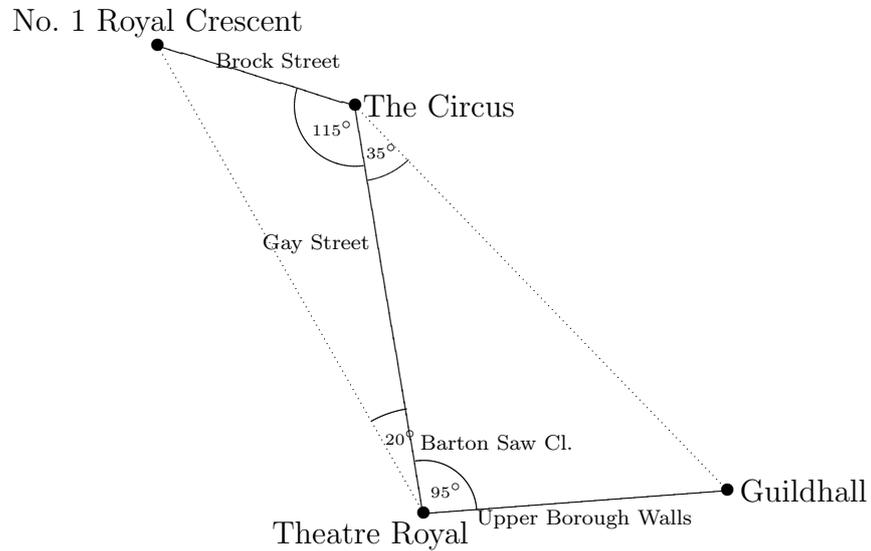
Please hand in your work at the Mathematics Reception Desk (1West 3.12) not later than Monday 3rd December at 12.15pm. You have to sign your work in and it should be accompanied by a signed coursework cover sheet (distributed with this assignment and also available from the reception desk.)

The work which you hand in should be the result of your own efforts and you should not collaborate with anyone else in this assignment. You should be prepared to explain anything which you write to the lecturer if asked to do so. Students caught cheating will be penalised.

1. Use the double angle identity $\cos(2A) = \cos^2(A) - \sin^2(A)$ together with $\cos^2 A + \sin^2 A = 1$ and $\cos 45^\circ = \frac{\sqrt{2}}{2}$ to calculate $\cos 22.5^\circ$ and $\sin 22.5^\circ$. Express the results using surds and also give these surds correct to 3 decimal places. [7]
2. By completing the square, find the lowest point on the curve $y = 2x^2 + 2x + 5$. Find any x - and y -intercepts for this curve and hence sketch the curve. [6]
3. Find the points of intersection of the line $y = x - 1$ with the circle of radius 4 around $(-2, 0)$. [4]
4. Sketch the curve $y = \frac{1}{x^2}$, marking all asymptotes. On a separate graph sketch $y = -\frac{1}{4}x$. On a third graph, sketch the curve $y = -\frac{1}{4}x + \frac{1}{x^2}$, marking the asymptotes and any x - and y -intercepts on the graph. [8]
5. Find the equation of the tangent line to the curve $y = 3x^2 - 1$ at the point $(1, 2)$. [3]
6. Find $\frac{dy}{dx}$ in each of the following cases:
 - (a) $y = x^3(1 + x^2)$.
 - (b) $y = \sqrt[5]{x} + x^7 + \frac{1}{x^2}$. [6]

Please turn over!

7. Consider the curve $y = x - x^{-1/3}$. Let P be the point on the curve with x coordinate equal to 1. Find the equations of the tangent and the normal to the curve at P . [5]
8. In a surveying exercise in Bath, the following simplified and rough map is obtained:



A pigeon starts at the Royal Crescent and flies in a straight line to the Guildhall. If the distance between the Circus and the Theatre Royal is 440 m, what distance has the pigeon travelled (round to metres)? [6]

Total: [45]