# **Pure 37 – Differentiation From First Principles and Small Angle Approximations**

Please **complete** this homework by \_\_\_\_\_\_\_\_\_\_.  Start it early. If you can’t do a question you will then have time to ask your teacher for help or go to a drop-in session.

## **Section 1 – Review of previous topics. Please complete all questions.**

1. Find the unit vector in the direction .
2. The position vector of the point A is and and the coordinates of point C are .

Find in terms of **i**, **j** and **k**,

* 1. the position vectors of B and C

Find the exact value of

* 1. The distance between A and C

1. Find the angles that the vector makes with each of the positive coordinate axes to 1 d.p.
2. Show that the function is decreasing for all .
3. . When , . Find .
4. Given that and solve .
5. Find the inverse function of , .
6. Find the equations of the tangents to the circle at the points where the circle cuts the axis.
7. Solve the simultaneous equations:

1. Solve .

## **Section 2 – Consolidation of this week’s topic. Please complete all questions.**

1. a) When θ is small, show that the expression can be written as 2θ + 1. **(3 marks)**

b) Hence write down the value of when θ is small. **(1 mark)**

1. For small show that . **(3 marks)**
2. Solve for the case when can be assumed to be small. **(3 marks)**
3. Differentiate the following from first principles:
   1. **(5 marks)**
   2. **(7 marks)**
   3. **(5 marks)**

**Total: 27 marks**