

MA10103: Foundation Mathematics I

PROBLEM SHEET 6

First class test on Thursday 8th November at 11:15-12:05 in 8West 2.1!

Please, do all questions and hand in solutions to the starred questions at the lecture on *Monday 12th November*.

1. For what values, in radians, of θ (between 0 and 2π) is $\sin \theta = -\frac{1}{2}$?
For what values, in radians, of θ (between -2π and 2π) is $\cos \theta = \frac{\sqrt{3}}{2}$?
For what values, in radians, of θ (between 0 and 4π) is $\tan \theta = \sqrt{3}$?
- 2*. We note, without proof, that $\cos \frac{2\pi}{5} = \frac{\sqrt{5}-1}{4}$.
 - (a) Calculate $\sin \frac{2\pi}{5}$ and $\tan \frac{2\pi}{5}$ (try to express them using surds, however, that might be quite complicated and you then might rather express it correct to 5 decimal places).
 - (b) For what values, in radians, of θ (between 0 and 2π) is $\cos \theta = \frac{\sqrt{5}-1}{4}$?
 - (c) For what values, in radians, of θ (between 0 and 2π) is $\sin \theta = \sin \frac{2\pi}{5}$?
3. Use $\tan \theta = \frac{\sin \theta}{\cos \theta}$ and $\sin^2 \theta + \cos^2 \theta = 1$ to show that

$$\cos^2 \theta = \frac{1}{1 + \tan^2 \theta}.$$

4. As usual, we denote the sides in a triangle by a , b and c and their opposing angles by A , B and C , respectively. In the following problems, find the values of the remaining side lengths and angles (to 3 decimal places). Also, calculate the area of the triangle.
 - (a) $a = 7$, $b = 3$ and $c = 6$.
 - (b) $A = 20^\circ$, $b = 5$ and $c = 4$.
 - (c) $A = 50^\circ$, $a = 7$ and $b = 4$.
 - (d) $A = 105^\circ$, $B = 44^\circ$ and $a = 5$.

- 5*. Find the two possible triangles with $A = 50^\circ$, $a = 4$ and $b = 5$ (give all values correct to 3 decimal places).

Please turn over!

6. Complete the following table:

| given | unknowns calculated using |
|--|---------------------------|
| all three sides | angles by cosine rule |
| two sides and enclosed angle | |
| two sides and angle opposing the longer side | |
| one side and two angles | |