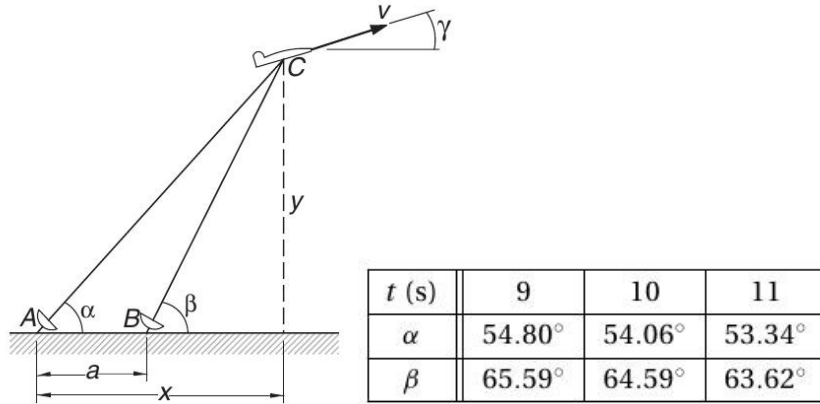


**UNIVERSITY OF SUSSEX**  
**Scientific Computing**  
**Tutor: Dr. Ilian Iliev, Office: Pev 3 4C5**

**Problem Sheet 6 (Both problems will be assessed)**  
**Deadline: 12pm on Monday, November 21st, 2016.**  
 Penalties will be imposed for submissions beyond this date.  
**Final submission date: Tuesday, November 22nd, 2016.**  
**No submissions will be accepted beyond this date.**



- The radar stations A and B, separated by the distance  $a = 500$  m, track the plane C by recording the angles  $\alpha$  and  $\beta$  at 1-second intervals, as shown in the figure. If three successive readings are shown in the table, calculate the speed  $v$  of the plane and the climb angle  $\gamma$  at  $t = 10$  s as accurate as you can. The coordinates of the plane can be shown to be:

$$x = a \frac{\tan \beta}{\tan \beta - \tan \alpha}, \quad y = a \frac{\tan \alpha \tan \beta}{\tan \beta - \tan \alpha}$$

[20]

- Derive the central difference approximation for  $f''(x)$  accurate to  $O(h^4)$  by applying Richardson extrapolation to the central difference approximation of  $O(h^2)$ .
  - Use the approximations in (a) to estimate the second derivative of  $f(x) = x^3 + e^{-x}$  at  $x = 1$  using  $h = 0.1$  and  $h = 0.5$ . What are the errors for each of the two approximations? Do they behave as expected?

[20]