ASSIGNMENT 7

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Latex-tikz codes from

1 QUESTION No 2.20

A bullet fired at an angle of 30° with the horizontal hits the ground 3.0 km away.By adjusting its angle of projection, can one hope to hit a target 5.0 km away? Assume the muzzle speed to be fixed, and neglect air resistance.

2 SOLUTION

Given that:

$$\text{Range, } \mathbf{R} = 3km \quad (2.0.1)$$

$$\text{Angle of projection, } \theta = 30° \quad (2.0.2)$$

$$\text{Acceleration due to gravity, } \mathbf{g} = 9.8m/s^2 \quad (2.0.3)$$

Horizontal range for the projection velocity $\mathbf{u_o}$, is given by the relation :

$$\mathbf{R} = \frac{\mathbf{u_o}^2 \sin 2\theta}{\mathbf{g}} \quad (2.0.4)$$

$$3 = \frac{\mathbf{u_o}^2 \sin 60°}{\mathbf{g}} \quad (2.0.5)$$

$$\frac{\mathbf{u_o}^2}{\mathbf{g}} = 2\sqrt{3} \quad (2.0.6)$$

The maximum range (**Rmax**) is achieved by the bullet when it is fired at an angle of 45 with the horizontal,

$$\mathbf{R_{max}} = \frac{\mathbf{u_o}^2}{\mathbf{g}} \quad (2.0.7)$$

on comparing equations (2.0.6) and (2.0.7), we get:

$$\mathbf{R_{max}} = 2 1.732 = 3.46km. \quad (2.0.8)$$

Hence, the bullet will not hit a target 5 km away.