**(b)** A particle is projected at an angle $\alpha = \tan^{-1} 3$ **to the horizontal** up a plane inclined at an angle θ to the horizontal. (The plane of projection is vertical and contains the line of greatest slope). The particle strikes the plane at right angles.

Find two possible values for θ.

$$r_j = u\sin(\alpha-\theta).t - \tfrac{1}{2}g\cos\theta.t^2 \qquad 5$$

$$v_i = u\cos(\alpha-\theta) - g\sin\theta.t \qquad 5$$

$$r_j = 0 \Rightarrow t = \frac{2u\sin(\alpha-\theta)}{g\cos\theta} \qquad 5$$

$$v_i = 0 \Rightarrow t = \frac{u\cos(\alpha-\theta)}{g\sin\theta} \qquad 5$$

$$\frac{2u\sin(\alpha-\theta)}{g\cos\theta} = \frac{u\cos(\alpha-\theta)}{g\sin\theta}$$

$$2\tan(\alpha-\theta).\tan\theta = 1$$

$$2\left\{\frac{\tan\alpha-\tan\theta}{1+\tan\alpha.\tan\theta}\right\}\tan\theta = 1 \Rightarrow 2\left\{\frac{3-\tan\theta}{1+3\tan\theta}\right\}\tan\theta = 1 \qquad 5$$

$$2\tan^2\theta - 3\tan\theta + 1 = 0$$

$$\Rightarrow \tan\theta = \tfrac{1}{2} \text{ or } \tan\theta = 1 \qquad 5$$

$$\Rightarrow \theta = 26.6° \text{ or } 45°$$

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