Answer on Question #70423, Physics / Mechanics | Relativity

How to calculate the angle made by the projected particle from the ground where it lands?

Solution:

Basic equations describing the motion of a body cast at an angle to the horizon:

$x=v_0*\cos\alpha_0*t$
$y=v_0*\sin\alpha_0*t-g*t^2/2$

We find the angle of the direction of the speed of flight of the body α_i at the point of the trajectory of interest to us. To do this, we write the initial pair of equations in the following form:

$y=x*tg\alpha_0-g*x^2/(2*v_0^2*(\cos\alpha_0)^2)$

This equation of the parabola is the flight trajectory.

We need to find the angle of inclination of the tangent to the parabola at the point of interest to us - this will be the angle α_i. To do this, we take the derivative, which is the tangent of the angle of inclination of the tangent:

$y'=tg\alpha_0-g*x/(v_0^2*(\cos\alpha_0)^2)$

We find the angle of incidence

$\alpha_i=$ arctg $y'=$arctg$(tg\alpha_0 — g*x/(v_0^2*(\cos\alpha_0)^2))$

Answer: $\alpha_i=$ arctg $y'=$arctg$(tg\alpha_0 — g*x/(v_0^2*(\cos\alpha_0)^2))$