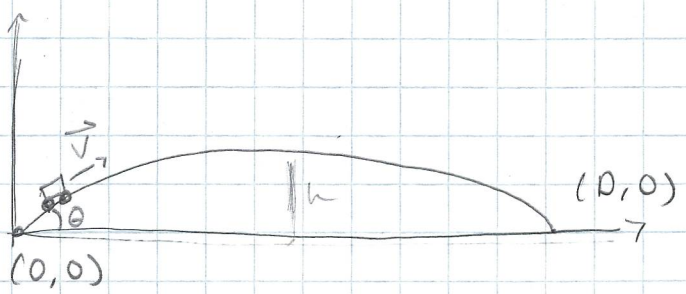
20-P-KM-AF-~~004~~ 014

Curvilinear Motion: Advanced

Q: Scientists have found a new planet 100 light years away whose surface can be described using the $-ax^2 + bx + c = 0$. If the car moves from the origin to $(D, 0)$ in C seconds. What is the cars scalar speed and angle from which it leaves? Neglect friction and energy gained / loss.

A:



a = ½ gravity of new planet

b = like initial velocity

$-ax + b = 0$

$x = b/a = D$

$v_x = D/C$

$h = -a(D/2)^2 + (D/2) \cdot b$

$v_y = \dfrac{2\left[-a(D/2)^2 + (D/2) \cdot b\right]}{C}$

$v = \sqrt{v_x^2 + v_y^2}$

$\theta = \tan(v_y / v_x)^{-1}$