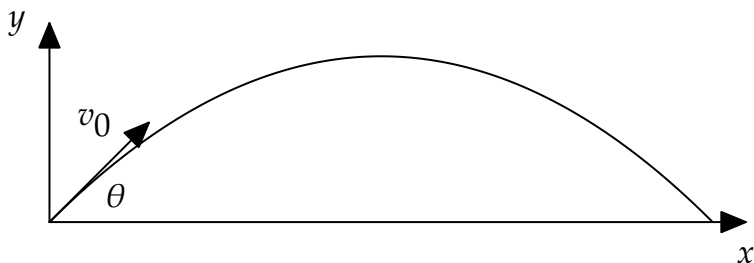


PHY 9A Discussion 2, Spring 2018

1. Throwing a Ball at an Angle

Alice throws a ball at an angle θ to the horizontal ground with the initial speed $v_0 = 10$ [m/s]. We ignore the effect of air resistance.



- What angle maximizes the horizontal traveling distance of the ball? Calculate the horizontal distance with the angle obtained.
- What is the maximum height that the ball can attain with the angle calculated above?
- Changing the angle from the maximizing one by $\Delta\theta$ gives the same horizontal traveling distance as the one obtained by changing it by $-\Delta\theta$. Prove this statement. Which of the two changes ($\Delta\theta$ or $-\Delta\theta$) gives shorter traveling time?

2. A Ball on an Inclined Ramp

Bob can run at a constant velocity $v = 10$ [m/s] for the first four seconds, but can only run as fast as $v = 6$ [m/s] afterward. Now Bob runs the 100-meter dash against a ball on an inclined ramp which makes an angle of θ with the ground. (Thus the ball actually runs the more-than-100-meter dash.) The ball is initially at rest, and we assume that there is no friction nor air resistance.

- What is the record time of Bob?
- Find the relationship between θ and the record time of the ball.
- What is the minimum angle with which Bob cannot win the race? Is there any way that Bob wins the race regardless of θ ? Explain.

