Physics 9A Section A Discussion Questions: Week 2

Question 1: Person Running Through Park

The position of a person running through a park can be described by:

$$\vec{r} = \left(20 \ (\text{m}) + \ 1.5 \ \left(\frac{\text{m}}{\text{s}^2}\right) * t^2\right)\hat{x} + \left(.3 \ \left(\frac{\text{m}}{\text{s}^3}\right) * \text{t}^3\right)\hat{y}$$

i: What is the magnitude and direction of their average velocity between t = 0 s and t = 10 s?

ii. What is their instantaneous velocity (magnitude and direction) at t = 5 s and t = 15s?

iii: What is the magnitude and direction of their average acceleration between t = 5 s and t = 15 s?

iv: What is their instantaneous acceleration (magnitude and direction) at t = 10 s?

v: At t = 15 s how far is the person from the entrance to the park located at x = 0 and y = 0?

Question 2: Catapult

A catapult launches rocks at a distant castle.

i: In order to launch the rocks the furthest distance, what angle should the rocks be launched at?

ii: The castle wall is 20 m high, and located 250 m from the catapult. In order for the rocks to just make it over the wall (launched at the angle found in part i), how fast do they need to be thrown?

iii: If the opposite castle wall is located 400 m (150 m further) from the catapult, what range of speeds will land rocks inside the walls?

Question 3: Carnival Ride

A student is on a ride that swings them around in a circle. The swing they are on has a length of 10 m.

i: If they are being swung at an angle of 50 degrees (with respect to the normal), at a speed of 10 m/s, what is the magnitude and direction of their acceleration?

ii: If their speed increases to 20 m/s, what angle does their swing make with respect to the normal?