SPH3U1 - Test 2

Time: 1 hour

September 30, 2022

There are a total of 4 questions + a bonus. Please answer all questions as detailed as possible.
A total of 100 points will be awarded for all the questions.
Please ignore any aerodynamic effects unless specified.

Questions

Q1 A projectile is launched straight up with an initial velocity v_i. If the initial velocity is halved, what would happen to

(a) the flight time of the projectile (10 pts)

(b) the apex of the trajectory (15 pts)

Q2 A ball is launched at the top of a building that is 45m tall, with an initial velocity of 20 m/s at an angle of 30° above the ground.

(a) How long will the ball stay airborne? (10 pts)

(b) How far will the ball travel before it hits the ground? (10 pts)

(c) What will the velocity of the ball be right before it hits the ground? (15 pts)

Q3 Ian is driving a car at 12 m/s [E 66°N]. He realize that there is a trash can in front of him at 23 m[N]. In a spark of impulse, Ian rolled down the window and threw out the trash bag in his car at a direction of [N 24°W]. While I highly discourage any of you to do the same, please calculate how fast Ian must throw this trash bag, so that it lands perfectly in that trash can. (25 pts)

Q4 Max is driving his F1 car, and he attempted to go over a bend and overtake his rival Lewis. His velocity went from 340 km/h[E 35°N] to 90 km/h[S 20°W]. If he made this turn within 3 seconds, what is the average acceleration of this maneuver? Please report your answer in polar form. (20 pts)

Bonus What is the most viewed YouTube video of all time? (2 pts)