SPH3U1 - Test 1

Time: 45min

August 20, 2022

There are a total of 6 questions + 2 bonus questions. Please answer all the 6 questions as detailed as possible. A total of 100 points will be awarded for all the questions excluding the bonus. The bonus questions can provide an additional 17 points to your final mark.

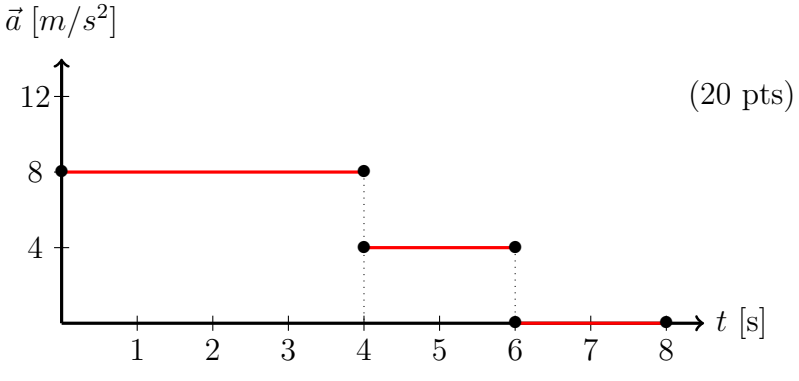
1 Questions

Q1 Use both vector scale graphs and algebraic calculation to determine the total displacement. (10pts)

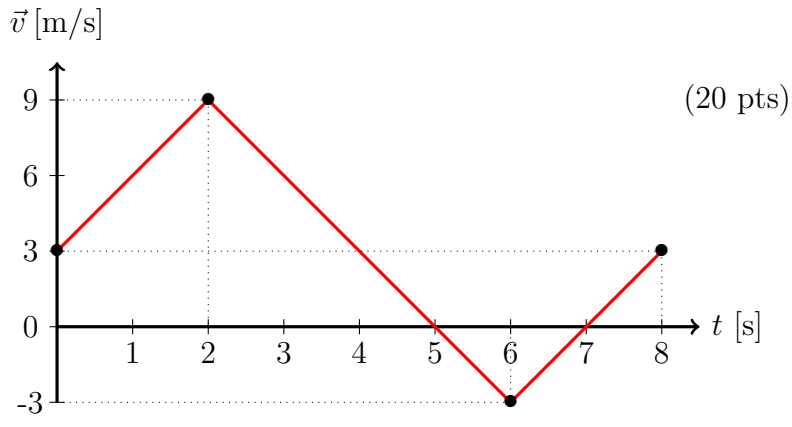
$$\vec{\Delta d}_1 = 3\,\text{m[E]};\ \vec{\Delta d}_2 = 4\,\text{m[W]};\ \vec{\Delta d}_3 = 2\,\text{m[E]};$$

Q2 Complete the set of the $\vec{d} - t$, $\vec{v} - t$ and $\vec{a} - t$ graphs from the graph given.

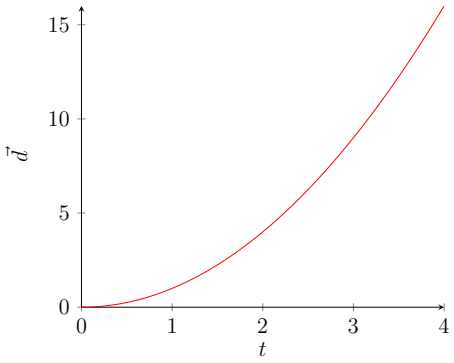
(a) (20 pts)



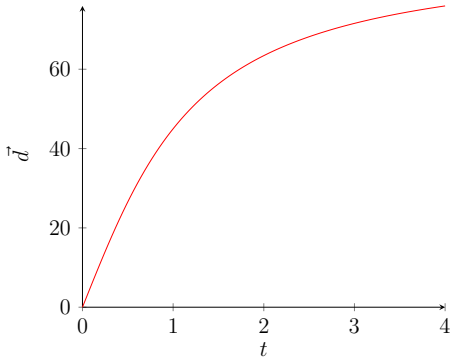
(b) (20 pts)



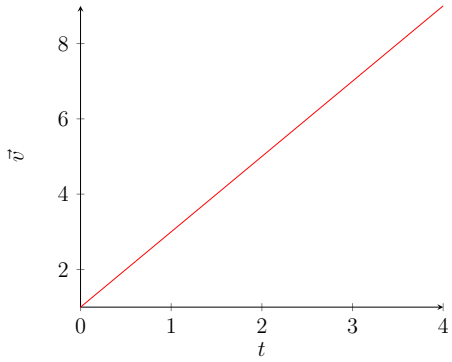
Q3 Determine the type of the motion from the graphs below. Explain your reasoning. (15 pts)



(a) (5pts)



(b) (5pts)



(c) (5pts)

Q4 A car on the highway is traveling at 100 km/h[N]. To make an exit from the high way, the driver brakes and the car experiences an acceleration of 2 m/s^2[S],

(a) how fast would the car be after 2 s? (5 pts)

(b) how much distance will the plane traverse in that 2 s interval? (7 pts)

Q5 A football player initially at rest charges across the field, covering 17m [E 20° N] in 3.8 s.

(a) What will the final velocity of the football player be? (5 pts)

(b) What is the average acceleration that she experienced? (8 pts)

Q6 A plane with a drag coefficient $C_D = 0.03$ is cruising at an altitude with air density of 0.45 kg/m^3 at a speed of 900 km/h. The wings of this plane has an area of 511 m^2

(a) What is the speed of the plane in our SI unit, m/s? (1 pts)
If you are wondering what SI unit is, I would suggest googling it.

(b) What is the unit of the drag force? (3 pts)

(c) Using this newly found SI unit of the speed of the plane, calculate the drag force experienced by the plane. (6 pts).

2 Bonus

B1 Below are some objects that experience acceleration under gravitational field of the Earth. Rank them based on the amount of gravitational acceleration experienced (neglect any other acceleration). (5 pts)

(a) A satellite in geosynchronous orbit that orbits our earth.

(b) The probe Voyager 1 sent by NASA, which is currently in the outer solar system.

(c) A Tesla in the factory.

(d) You. Yes, you.

AND: explain your reasoning. (10 pts)

Hint: if the object experience the same amount of gravitational pull, put an equal sign between them. i.e., if A experience the same gravitational acceleration than B, and C is greater than both of them, write as

$$A = B < C$$

B2 Who lives in a pineapple under the sea? (2 pts)