ÇANKAYA UNIVERSITY

PHYS 131 – PHYSICS I

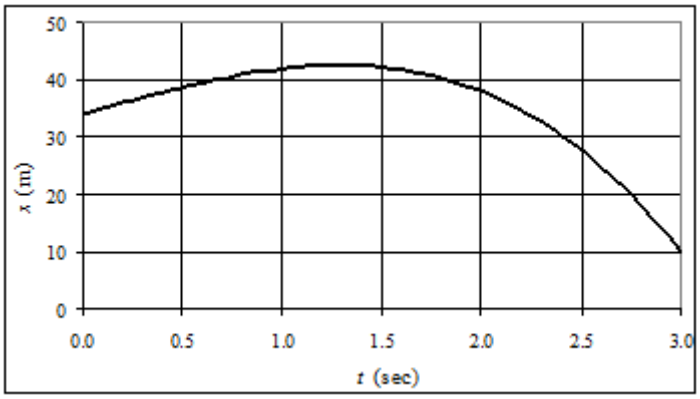
CHAPTER II

MOTION ALONG A STRAIGHT LINE

PROBLEM SET

1) You are driving home from school steadily at 95 km / h for 130 km. It then begins to rain and you slow to 65 km / h. You arrive home after driving 3 hours and 20 minutes. (*a*) How far is your hometown from school? (*b*) What was your average speed?
[Answer: a)$2,6\times10^2\ km$, b) 77 km/h]

2) *** The position of a small object is given by $x=34+10t-2t^3$, where t is in seconds and x in meters. (*a*) Plot x as a function of t from $t=0$ to $t=3.0\,\text{s}$. (*b*) Find the average velocity of the object between 0 and 3.0 s. (*c*) At what time between 0 and 3.0 s is the instantaneous velocity zero? **[Answer: a)Figure below,b) -8 m/s, c) 1,3 s]**



3) A car moving in a straight line starts at $x=0$ at $t=0$. It passes the point $x=25.0\,\text{m}$ with a speed of 11.0 m / s at $t=3.00\,\text{s}$. It passes the point $x=385\,\text{m}$ with a speed of 45.0 m / s at $t=20.0\,\text{s}$. Find (*a*) the average velocity and (*b*) the average acceleration between $t=3.00\,\text{s}$ and $t=20.0\,\text{s}$. **[Answer: a) 21,2 m/s, b)$2,00\ m/s^2$]**

4) An inattentive driver is traveling 18.0 m / s when he notices a red light ahead. His car is capable of decelerating at a rate of $3.65\,\text{m/s}^2$. If it takes him 0.200 s to get the brakes on and he is 20.0 m from the intersection when he sees the light, will he be able to stop in time? **[Answer: distance=48.0 m>20.0 m, He will NOT be able to stop in time]**

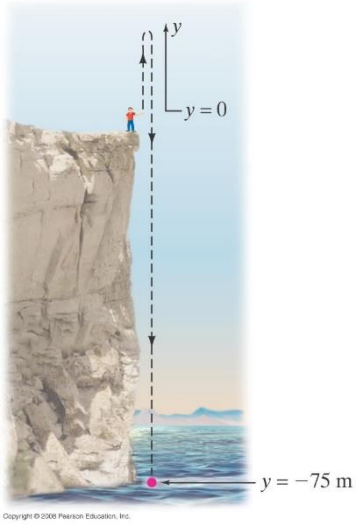
5) A space vehicle accelerates uniformly from 65 m / s at $t = 0$ to 162 m / s at $t = 10.0$ s. How far did it move between $t = 2.0$ s and $t = 6.0$ s?
[Answer: $4,2 \times 10^2\ m$]

6) ***A baseball is seen to pass upward by a window 23 m above the street with a vertical speed of 14 m / s. If the ball was thrown from the street, (*a*) what was its initial speed, (*b*) what altitude does it reach, (*c*) when was it thrown, and (*d*) when does it reach the street again? **[Answer: a)25 m/s, b)33m, c)1,2 s, d)5,2 s]**

7) Given $v(t)=25+18t$, where v is in m / s and t is in s, use calculus to determine the total displacement from $t_1 = 1.5$ s to $t_2 = 3.1$ s. **[Answer: 106 m]**

8) A stone is dropped from the roof of a high building. A second stone is dropped 1.50 s later. How far apart are the stones when the second one has reached a speed of 12.0 m / s? **[Answer: 29,0 m]**

9) ***A stone is thrown vertically upward with a speed of 12.5 m / s from the edge of a cliff 75.0 m high (Fig. 2–49). (*a*) How much later does it reach the bottom of the cliff? (*b*) What is its speed just before hitting? (*c*) What total distance did it travel?
[Answer: a)5,39 s, b)40,3 m/s, c)90,9 m]



10) A lifeguard standing at the side of a swimming pool spots a child in distress, Fig. 2–53. The lifeguard runs with average speed along the pool's edge for a distance x, then jumps into the pool and swims with average speed on a straight path to the child. (a) Show that the total time it takes the lifeguard to get to the child is given by

$$\frac{x}{v_R} + \frac{\sqrt{D^2 + (d-x)^2}}{v_S}$$

[Answer:

$$t = t_{\text{land}} + t_{\text{pool}} = \frac{d_{\text{land}}}{v_{\text{land}}} + \frac{d_{\text{pool}}}{v_{\text{pool}}}$$

$$= \frac{x}{v_R} + \frac{\sqrt{D^2 + (d-x)^2}}{v_S}$$ **]**