		1	2	3	4	Tot.
Name:						
ID No:						
Section:						

Full Mark: 40 points	**Answer all questions**

Saturday, 1ˢᵗ October 2005   *Time: 5:15 – 6:45 pm*

1. A particle moves along the x axis according to the equation:

$$x = -50t + 2t^2$$

where x is in meters and t in seconds.

Find:
a) The position of the particle when it momentarily stops.
b) The acceleration of the particle when it momentarily stops.
c) The velocity of the particle when it returns to its initial position.
d) The average velocity in the time interval t = 10 s and t = 15 s.
e) The average speed in the time interval t = 10 s and t = 15 s.

                                                                  (10 marks)

2. Two vectors **a** and **b** are given by:

$\mathbf{a} = (4.0\text{m})\mathbf{i} - (3.0\text{m})\mathbf{j} + (2.0\text{m})\mathbf{k}$ and $\mathbf{b} = (-2.0\text{m})\mathbf{i} + (4.0\text{m})\mathbf{j} - (3.0\text{m})\mathbf{k}$

In unit-vector notation, find:

a) The vector **a** + **b**
b) The vector **a** − **b**
c) The angle between the vecor **a** and z-axis.
d) The magnitude of a vector **c** such that: **c** = (**a** + **b**)×(**a** − **b**)

(10 marks)

3. A ball is thrown from the edge of a building of height $h_1 = 100$ m with an initial speed of 20 m/s at an angle of 20° below the horizontal (*as shown in the figure*). The wall is 50 m from the release point of the ball, as shown in the figure.
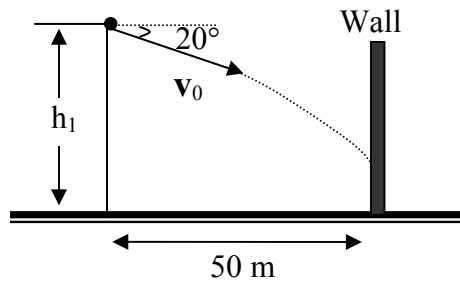

Find:

a) The velocity of the ball as it hits the wall (in unit-vector notation and magnitude-direction notation)

b) The horizontal distance traveled by the ball when the line tangent to its path makes an angle of 37° with the horizontal.

c) The vector displacement $\Delta\mathbf{r}$ between $t = 1$ s and $t = 2$ s.

(10 marks)

4. Two blocks of masses $m_1 = 10$ kg and $m_2 = 4$ kg are connected by a cord over a massless and frictionless pulley. The block m_1 is on $53°$– inclined plane whereas block m_2 is on $37°$– inclined plane. Both inclined planes are frictionless. A horizontal force **F** of magnitude 25 N is applied on block m_1 as shown in the figure.
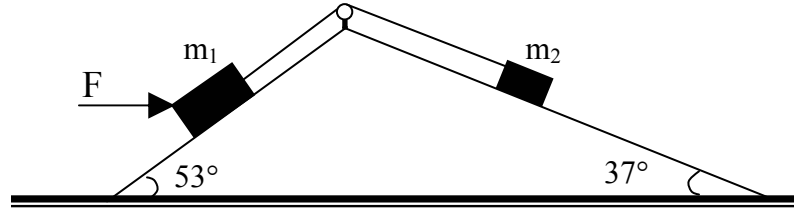
a) What is the <u>acceleration</u> of the blocks and the <u>tension</u> in the cord?
b) What is the velocity of m_1 when it has traveled a distance of 5 m down the $53°$– inclined plane?

(10 marks)