

Sultan Qaboos University
Department of Physics, College of Science
PHYS2107: Physics for Engineering I - Test 1

Name:
ID No:

1	2	3	4	Tot.

Full Mark: 40 points	Answer all questions
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Monday, 6th March 2006

Time: 5:15 – 6:45 pm

Take the gravitational acceleration $g = 9.8 \text{ m/s}^2$

1. The position of a particle moving along the x -axis is given by:

$$x = 6t^2 - t^3$$

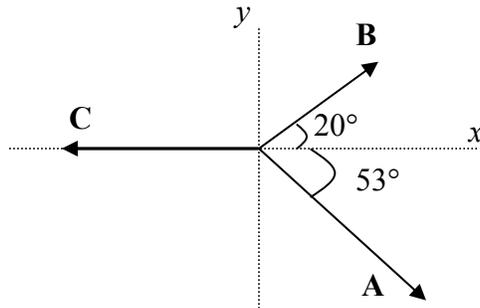
where x is in meters and t in seconds.

For $t > 0$,

- What is the acceleration of the particle when it momentarily stops?
- What are the distance and displacement of the particle between $t = 0 \text{ s}$ and $t = 6 \text{ s}$?
- Find the positions of the particle when its velocity is 5 m/s .

Mark: 3+4+3

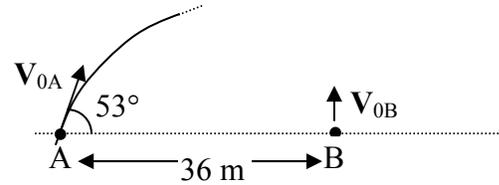
2. Three vectors **A**, **B** and **C** are shown in the figure. Their magnitudes are $A = 10$ m, $B = 5$ m and $C = 15$ m.



- What is the vector **D** such that $\mathbf{D} = \mathbf{A} - 2\mathbf{B} + \mathbf{C}$ in unit-vector notation?
- Draw the vector **D** on an x - y coordinate system (indicating the angle of **D** with x -axis).
- Find the angle between $\mathbf{A} \times \mathbf{B}$ and **C**.

Mark: 4+3+3

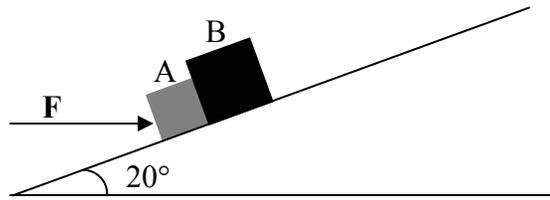
3. Two stones A and B, initially 36 m apart, are thrown from the ground at the same instant as shown in the figure. The initial velocity of stone A makes an angle of 53° above the horizontal and has a magnitude of 20 m/s; whereas the stone B is thrown vertically upward. If the two balls cross each other (meet without colliding) later:



- What is the initial speed of the stone B?
- What is the velocity of stone A at the meeting point?
- At the meeting point, has stone B passed its highest point on its trajectory? *Justify your answer.*
- Which of the two balls reaches first the ground? *Justify your answer.*

Mark: 3+3+2+2

4. A horizontal force F of magnitude 100 N is applied to block A of mass 2.5 kg, which pushes against block B of mass 4 kg. The two blocks are on a frictionless 20° -inclined plane as shown in the figure.



- Draw the free-body diagrams of the two objects.
- What is the acceleration of the blocks?
- What is the force from block B on block A?

Mark: 3+3+4