

## Physics Quiz # 3

Date Given: April 21, 2022

Date Due: April 28, 2022

- Q1.** (1 point) The time derivative of a vector is a:
- (a) Tensor (multi-dimensional array of numbers).
  - (b) Either a scalar or a vector.
  - (c) Scalar.
  - (d) Vector.
- Q2.** (1 point) The magnitude of the velocity vector is called the:
- (a) Acceleration and it is a vector.
  - (b) Acceleration and it is a scalar.
  - (c) Speed and it is a scalar.
  - (d) Speed and it is a vector.
- Q3.** (2 points) For a particle moving in 3D along a helix curve given as  $\mathbf{p}(t) = \alpha \cos \omega t \mathbf{i} + \alpha \sin \omega t \mathbf{j} + \gamma t \mathbf{k}$ , where  $\alpha, \gamma, \omega$  are some constants:
- (a) Show that the speed of the particle is constant.
  - (b) Find out the angle between the velocity and acceleration vectors.
- Q4.** (2 points) A particle which moves in two-dimensional motion has coordinates given in millimeters by  $x = t^2 - 4t + 20$  and  $y = 3 \sin 2t$ , where the time  $t$  is in seconds. Determine the magnitude of the velocity vector and the angle between the velocity and acceleration vectors at time  $t = 3$ s.
- Q5.** (1 point) The path followed by a bouncing ping-pong ball is a:
- (a) Hyperbola.
  - (b) Circle.
  - (c) Straight line.
  - (d) Parabola.
- Q6.** (3 points) The ball is kicked from point A with the initial velocity  $v_A = 10$ m/s. Determine a) the maximum height  $h$  it reaches, and b) the range  $x_C$ , and c) the speed when the ball strikes the ground.

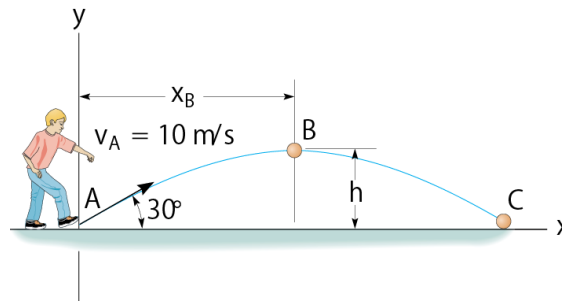


Figure 1: Illustration to Q6.