

Quiz 3

Name: _____ Student Number: _____

1. (4 marks) A car enters a turn that has a radius of 0.5 km with a speed of 100 km/hr. What is the centripetal acceleration in m/sec^2 if the car remains at the same speed and does not fly out of the turn?

$$\text{Centripetal Acceleration } a = \frac{v^2}{r}$$

$$\begin{aligned} 100 \text{ km/hr} &= 100 \frac{\text{km}}{\text{hr}} \times \frac{1000 \text{ m}}{\text{km}} \times \frac{1 \text{ hr}}{3600 \text{ sec}} \\ &= 27.8 \text{ m/sec.} \end{aligned}$$

$$\begin{aligned} \therefore a &= \frac{(27.8 \text{ m/sec})^2}{500 \text{ m}} \\ &= 1.54 \text{ m/sec}^2 \end{aligned}$$

2. (3 marks) Write down Newton's 3 laws.

- 1) A body remains at rest or continues moving with constant velocity unless acted on by a force.
- 2) A force \vec{F} acting on a body causes an acceleration \vec{a} in direction of force with magnitude inversely proportional to the body mass m .
- 3) Whenever body A exerts force on body B, then body B exerts force on A of equal magnitude but opposite direction.

3. (3 marks) A 0.5 kg puck experiences two forces $\vec{F}_1 = (5, 2)$ and $\vec{F}_2 = (1, -1)$ Newtons.

- a) What is the total force exerted on the puck?

$$\begin{aligned}\vec{F}_{TOT} &= \vec{F}_1 + \vec{F}_2 \\ &= (5, 2) + (1, -1) \\ &= (6, 1) \text{ Newtons}\end{aligned}$$

- b) What is the acceleration of the puck?

$$\begin{aligned}\text{Acceleration } \vec{a} &= \frac{\vec{F}_{TOT}}{m} \\ &= \frac{(6, 1)}{0.5} \\ &= (12, 2) \text{ m/sec}^2\end{aligned}$$

- c) What is the magnitude of the acceleration in m/sec^2 .

$$\begin{aligned}|\vec{a}| &= \sqrt{12^2 + 2^2} \\ &= \sqrt{148} \\ &= 2\sqrt{37} \text{ m/sec}^2\end{aligned}$$

Total = 10 marks