

Name _____

Date _____

CLASSICAL MECHANICS

1. A particle moves in a circle of radius r with constant angular velocity ω .
At time $t=0$, the particle is at the point $(r, 0)$ in the Cartesian coordinate system.

2. What is the position vector $\mathbf{r}(t)$ of the particle at time t ?

3. What is the velocity vector $\mathbf{v}(t)$ of the particle at time t ?

4. What is the acceleration vector $\mathbf{a}(t)$ of the particle at time t ?

5. Show that the acceleration vector $\mathbf{a}(t)$ is always directed towards the center of the circle.
What is the magnitude of the acceleration vector $\mathbf{a}(t)$?

6. Show that the speed of the particle is constant.

7. If you know the position vector $\mathbf{r}(t)$ of a particle, what is its velocity vector $\mathbf{v}(t)$?

8. The table below shows the results of a series of experiments. What is the value of x ?

Time t (s)	Displacement x (m)	Velocity v (m/s)	Acceleration a (m/s ²)
0	0	0	0
1	1	2	2
2	4	4	2
3	9	6	2
4	16	8	2
5	25	10	2
6	36	12	2
7	49	14	2
8	64	16	2
9	81	18	2
10	100	20	2

9. How long does it take for the particle to travel a distance of 100 m?

10. What is the speed of the particle at $t = 10$ s?

11. What is the speed of the particle at $t = 10$ s?

12. What is the speed of the particle at $t = 10$ s?

13. What is the speed of the particle at $t = 10$ s?

14. What is the speed of the particle at $t = 10$ s?