Motion in plane

Here are some key terms and definitions from the "Motion in a Plane" chapter in the provided PDF:

1. **Scalars**: Quantities with magnitude only. Examples include distance, speed, mass, and temperature.
2. **Vectors**: Quantities with both magnitude and direction. Examples include displacement, velocity, and acceleration. They follow vector algebra rules.
3. **Position Vector**: The position vector $\mathbf{r}$ of a particle P located in a plane with reference to the origin of an x-y reference frame is given by $\mathbf{r} = x\hat{i} + y\hat{j}$, where x and y are the coordinates of the object .
4. **Displacement**: The change in position of a particle. If a particle moves from $\mathbf{r}$ to $\mathbf{r}'$, the displacement is $\Delta\mathbf{r} = \mathbf{r}' - \mathbf{r}$.
5. **Velocity**: The rate of change of displacement. The average velocity $\mathbf{v}$ is given by $\mathbf{v} = \frac{\Delta\mathbf{r}}{\Delta t}$. Instantaneous velocity is the limit of the average velocity as Δt approaches zero: $\mathbf{v} = \frac{d\mathbf{r}}{dt}$.
6. **Acceleration**: The rate of change of velocity. The average acceleration $\mathbf{a}$ is given by $\mathbf{a} = \frac{\Delta\mathbf{v}}{\Delta t}$. Instantaneous acceleration is the limit of the average acceleration as Δt approaches zero: $\mathbf{a} = \frac{d\mathbf{v}}{dt}$.
7. **Projectile Motion**: The motion of an object thrown or projected into the air, subject to only the acceleration of gravity. The horizontal and vertical motions are independent of each other. The path of a projectile is parabolic .
8. **Uniform Circular Motion**: Motion in a circular path with constant speed. The acceleration is directed towards the center of the circle and has magnitude $\mathbf{a}_c = \frac{v^2}{R}$, where v is the speed and R is the radius of the circle .