### Key Equations

|  |  |
| --- | --- |
| Position vector |  |
| Displacement vector |  |
| Velocity vector |  |
| Velocity in terms of components |  |
| Velocity components |  |
| Average velocity |  |
| Instantaneous acceleration |  |
| Instantaneous acceleration, component form |  |
| Instantaneous acceleration as second derivatives of position |  |
| Time of flight |  |
| Trajectory |  |
| Range |  |
| Centripetal acceleration |  |
| Position vector, uniform circular motion |  |
| Velocity vector, uniform circular motion |  |
| Acceleration vector, uniform circular motion |  |
| Tangential acceleration |  |
| Total acceleration |  |
| Position vector in frame *S* is the position vector in frame plus the vector from the origin of *S* to the origin of |  |
| Relative velocity equation connecting two reference frames |  |
| Relative velocity equation connecting more than two reference frames |  |
| Relative acceleration equation |  |