Exercises 07

A spacecraft is in orbit about a planet whose gravitational constant is $\mu = 12$. At some instant of time, when the vehicle is at the point $P_1$ for which $r_1 = 4i_x$, a velocity change $\Delta v_1$ is made to place the vehicle in a new orbit to intercept a target at the point $P_2$ for which $r_2 = 4i_x + 4\sqrt{3}i_y$. The velocity at $P_1$, before the impulse, is $v_0 = \frac{2}{3}\sqrt{3}i_y$.

1. Calculate the elements $a$, $p$ and $h$ of the orbit before the impulse.

2. Calculate the optimum $\Delta v_1$ by first using an appropriate iteration algorithm to obtain the orbital parameter. Then determine the corresponding chordal and extended radial components of the optimum velocity. The resulting velocity vector should be

$$v_1 = i_x + \sqrt{3}i_y$$

3. Find the new orbital elements.

4. Illustrate the calculations with an appropriate vector diagram.