16.346 Astrodynamics
Fall 2008

Exercises 08

In a two-body boundary-value problem, the initial and terminal position vectors are:

$$\mathbf{r}_1 = 3\,\mathbf{i}_x \qquad \text{and} \qquad \mathbf{r}_2 = -4\,\mathbf{i}_x + 3\,\mathbf{i}_y$$

The gravitational constant is $\mu = 60$.

Two orbits connecting $\mathbf{r}_1$ and $\mathbf{r}_2$ are possible for which the magnitude of the velocity vector is $v_1 = |\mathbf{v}_1| = 5$.

For **each** of these orbits calculate the following quantities:

1. The semimajor axis a
2. The parameter p
3. The transfer time $t_2 - t_1$ from $\mathbf{r}_1$ to $\mathbf{r}_2$.

For the orbit having the **shorter** transfer time, calculate

4. The velocity vectors $\mathbf{v}_1$ and $\mathbf{v}_2$ at the terminals.
5. The angular momentum vector $\mathbf{h}$ and the eccentricity vector $\mathbf{e}$.
6. The true anomaly f_1 of the initial position vector and the eccentric anomaly difference $E_2 - E_1$.