

Total points: 100 (10 pts per question)

A spacecraft orbiting Earth has the following position and velocity in the ECI-fixed coordinate system at initial time:

$$\mathbf{r}_0 = [8000; 0; 6000]; \text{ km} \quad \mathbf{v}_0 = [0; 6.3133; 0]; \text{ km/s}$$

Questions:

1. What kind of orbit is it? [10 pts] **CIRCULAR**
2. What is its period? [10 pts] **SEE MATLAB FILE**
3. What kind of orbit does it become if the velocity, at initial time, instantaneously changes to $\sqrt{2}\mathbf{v}_0$? [10 pts] **PARABOLIC**
4. What kind of orbit if, instead, the velocity, at initial time, instantaneously changes to $2\mathbf{v}_0$? [10 pts] **HYPERBOLIC**
5. What is the flight path angle for the orbit at point 3 when the true anomaly is 40 degrees? [10 pts] **20 DEG**
6. What is the maximum true anomaly the spacecraft can reach in the orbit at point 4? [10 pts] **SEE MATLAB FILE**

TRUE OR FALSE?

7. In a parabolic orbit, the magnitude of kinetic energy and potential energy are the same at all points. [10 pts] **TRUE**
8. The transport theorem is only valid if one of the two reference frames involved is inertial. [10 pts] **FALSE**
9. The transport theorem is only valid if one of the two reference frames only rotates. [10 pts] **FALSE**
10. A spacecraft coasts to infinity on a hyperbolic orbit, with no residual relative velocity. [10 pts] **FALSE**