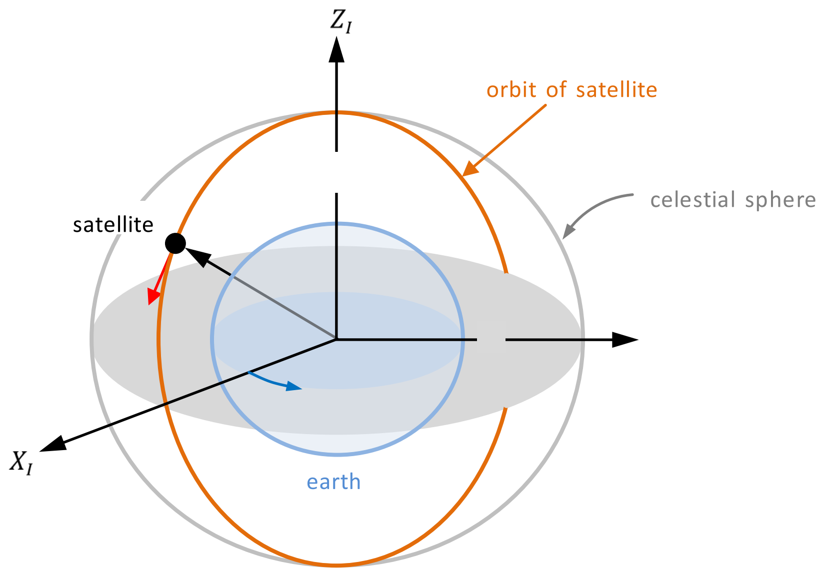
Homework #2

Due Date : 28 Mar., 2020 (11:59 pm)

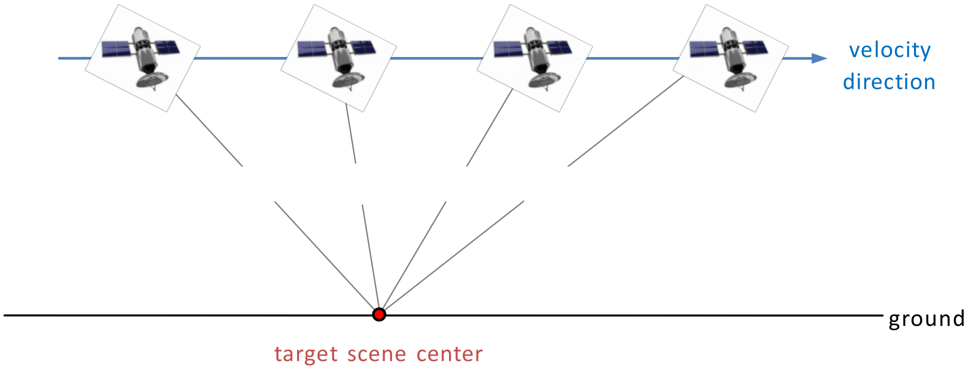
Problem 1. Consider a satellite which rotates around the Earth along the predetermined ellipsoidal orbit defined in ECI (Earth-centered Inertial) frame.



The navigation sensor mounted on the satellite provides the position and velocity vectors in every 2-second. Using the following 5-point ephemeris data, make your own C-program to find the satellite position and velocity vectors at specific time instance between $t = 2123[sec]$ and $t = 2131[sec]$.

$t\ [sec]$	$\vec{R}_s^I\ [km]$			$\vec{V}_s^I\ [km/s]$		
	$\vec{R}_s^I(x)$	$\vec{R}_s^I(y)$	$\vec{R}_s^I(z)$	$\vec{V}_s^I(x)$	$\vec{V}_s^I(y)$	$\vec{V}_s^I(z)$
2123	−2163.22447	4415.78095	4879.67927	−1.03959	5.34327	−5.28319
2125	−2165.29848	4426.45691	4869.10118	−1.03441	5.33269	−5.29489
2127	−2167.36210	4437.11169	4858.49973	−1.02922	5.32208	−5.30656
2129	−2169.41539	4447.74523	4847.87496	−1.02404	5.31145	−5.31820
2131	−2171.45828	4458.35748	4837.22693	−1.01885	5.30080	−5.32983

Problem 2. Consider the relative kinematics between the satellite and the target scene center obtained from the space borne radar as shown in the following figure.



In the above, t means the time acquiring the signal reflecting by the target, and r indicates the range from the satellite to the target.

Given the target scene center $\vec{R}_t^I = [-1577.12682 \quad 4207.54609 \quad 4511.39410]^T [km]$ and the satellite ephemeris data in Problem 1, make the Lagrange interpolation and Newton interpolation using divided difference to find the minimum range and the corresponding time which are necessary for radar signal processing.