```
syms theta omega i a e f small_omega

%% 1.1.a
first_matrix_rotation = [cos(omega) sin(omega) 0;-sin(omega)↙
cos(omega) 0;0 0 1];
second_matrix_rotation = [1 0 0;0 cos(i) sin(i);0 -sin(i) cos↙
(i)];
third_matrix_rotation = [cos(theta) sin(theta) 0;-sin(theta)↙
cos(theta) 0;0 0 1];
DCM_ECI_to_LVLH = third_matrix_rotation *↙
second_matrix_rotation * first_matrix_rotation;
DCM_LVLH_to_ECI = DCM_ECI_to_LVLH.';

%% 1.1.b
first_matrix_rotation = [cos(omega) sin(omega) 0;-sin(omega)↙
cos(omega) 0;0 0 1];
second_matrix_rotation = [1 0 0;0 cos(i) sin(i);0 -sin(i) cos↙
(i)];
third_matrix_rotation = [cos(small_omega + f) sin(small_omega↙
+ f) 0;-sin(small_omega + f) cos(small_omega + f) 0;0 0 1];
DCM_ECI_to_LVLH = third_matrix_rotation *↙
second_matrix_rotation * first_matrix_rotation;
DCM_LVLH_to_ECI = DCM_ECI_to_LVLH.';

r = a*(1-e^2)/(1+e*cos(f));
r_LVLH = [r;0;0];
r_ECI = DCM_LVLH_to_ECI * r_LVLH;
r_dot_ECI = diff(r_ECI,f);
```