```
//
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//
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//

function udot = f(t, u)
    G = 6.67D-11; //Gravitational constant
    M = 5.98D24; //Mass of the Earth
    c = -G * M;
    r_earth = 6.378E6; //radius of the Earth
    r = sqrt(u(1)^2 + u(2)^2);
    // Write the relationhsip between udot and u
    if r < r_earth then
        udot = [0 0 0 0]';
    else
        A = [[0     0     1 0];
             [0     0     0 1];
             [c/r^3 0     0 0];
             [0     c/r^3 0 0]];
        udot = A*u;
    end
endfunction

function U = earthrotation(altitude, v_init, hours)
    // altitude given in km
    // v_init is a vector [vx; vy] given in m/s
    // hours is the number of hours for the simulation
    r_earth = 6.378E6;
    altitude = altitude * 1000;
    U0 = [r_earth + altitude; 0; 0; v_init];
    t = 0:10:(3600*hours); // simulation time, one point every 10
seconds
    U = ode(U0, 0, t, f);

    // Draw the earth in blue
    angle = 0:0.01:2*%pi;
    x_earth = 6378 * cos(angle);
    y_earth = 6378 * sin(angle);
    fig = scf();
    a = gca();
    a.isoview = "on";
    plot(x_earth, y_earth, 'b--');
    plot(0, 0, 'b+');
    // Draw the trajectory computed
    comet(U(1,:)/1000, U(2,:)/1000, "colors", 3);
endfunction
```

```
//Earth Rotation at geostationnary orbit
geo_alt = 35784; // in kms
geo_speed = 3074; // in m/s
simulation_time = 24; // in hours
U = earthrotation(geo_alt, geo_speed, simulation_time);
```