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```
function xdot = OrbDyn(t,x,params) %#ok<INUSL>

% Usage: params = struct(a,b,c)
%        xdot = OrbDyn(x,params)
%
% Written by Garrett Ailts
%
% Descritpion: Orbital Equations of motion assuming point mass under
% gravity force from a point mass where mp>>ms
%
% Inputs:
%   x       -  6 x 1 column matrix of position and velocity values
%   params  -  struct of values and constants needed for computation
 of
%              rates of change
%
% Outputs:
%   xdot  -  6 x 1 vector of the instantaneous rates of change of the
 input
%            state vector (velocity and acceleration)
%
%
```

Extract Parameters from Struct

```
mu = params.Earth.mu_e;
R = params.Earth.Rmean;
J2 = params.Earth.J2const;
J2on = params.Earth.J2on;
```

Define Useful Constants

```
I3 = [0 0 1]';
```

Check for Earth Impact

```
r = norm(x(1:3));
if r<=R
    warning('Earth impact!')
end
```

Assemble Rate of Change Matrix

Check For J2 Inclusion

```
if ~J2on
    J2 = 0;
end
% Calculate xdot
xdot = [x(4:6); -mu*x(1:3)/r^3 + (3*mu*J2*R^2/2/r^5)*(((5/r^2)* ...

 (x(1:3)'*I3)-1)*x(1:3)-2*(x(1:3)'*I3)*I3)];
```

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