Contents

Initialize

```
clear; clc;
```

Define variables and constants

```
tspan = [0 24*3600];
mu = 398600;
R = 6378;
r0 = [6600 0 0];
v0 = [0 12 0];
ics = [r0'; v0'];
```

Solve non-stiff differential equations, medium order method.

```
[t, y] = ode45(@dstate, tspan, ics);
```

print results

```
fprintf("dist. @ 24hr: %.2f km \n", norm([y(end,1) y(end,2) y(end,3)]));
fprintf("speed @ 24hr: %.2f km/s", norm([y(end,4) y(end,5) y(end,6)]));
```

```
dist. @ 24hr: 463290.13 km
speed @ 24hr: 4.99 km/s
```

Plot results

```
%figure;
%clf;
%plot3(y(:,1), y(:,2), y(:,3));
%grid;
%xlabel('x (m)');
```

```
%ylabel('y (m)');
%zlabel('z (m)');
```

Define derivative function

```
function ddt = dstate(t, yi)
```

define constants

```
    mu = 398600;
```

get state from inputs

```
    x = yi(1);
    y = yi(2);
    z = yi(3);
    vx = yi(4);
    vy = yi(5);
    vz = yi(6);
    r = norm([x y z]);
```

Define derivatives

```
    ax = -mu*x/r^3;
    ay = -mu*y/r^3;
    az = -mu*z/r^3;
```

create output vector

```
    ddt = [vx; vy; vz; ax; ay; az];
```

```
end
```

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