ASEN 5044 HW 1 Script

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Housekeeping

```
clc; clear; close all;
```

Problem 3b

```
% Constants
p0 = 20; % rad/s
Ix = 500; % kgm^2
Iy = 750; % kgm^2
Iz = 1000; % kgm^2

dt = 0.1; % sec

% ABCDs
A = [
        0   0                 0
        0   0                 (p0*(Ix - Iz))/Iy
        0   (p0*(Iy-Ix))/Iz   0
    ];

B = [
        1/Ix    0       0
        0       1/Iy    0
        0       0       1/Iz
    ];

C = eye(3);

D = zeros(3,3);

% Find matrix exponential
STM_3b = expm(A*dt)

% input("Press 'Enter' to continue to 3c")
```

```
STM_3b =

    1.0000         0         0
```

```
         0    0.6848   -1.1900
         0    0.4463    0.6848
```

Problem 3c

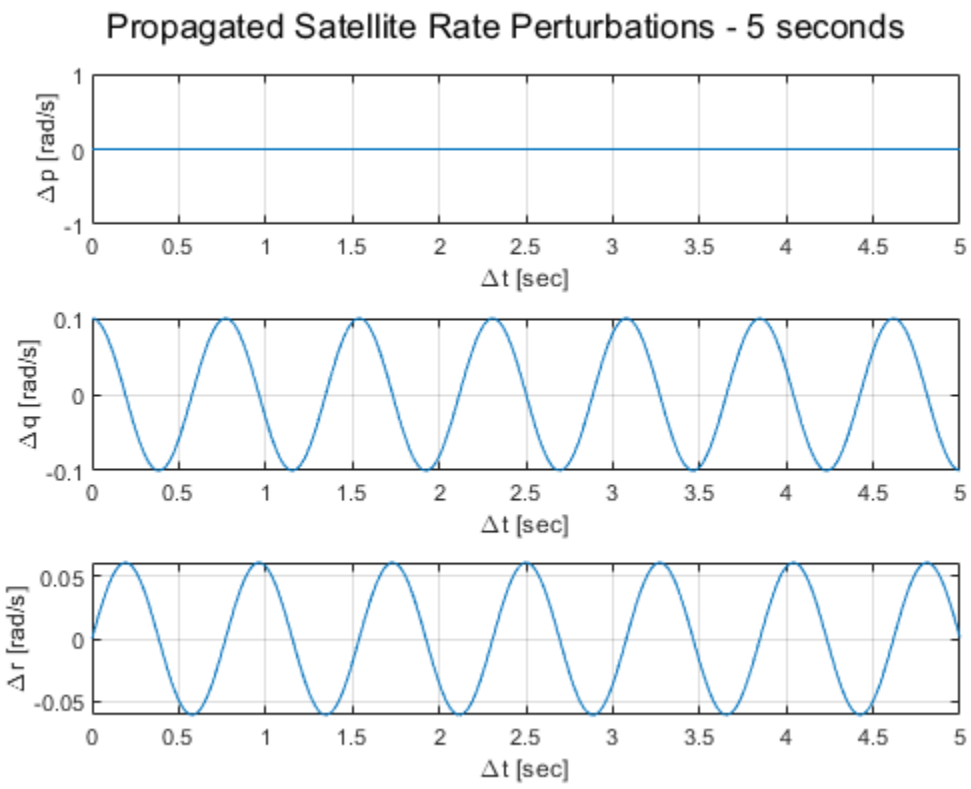
```
% Constants
x0 = [0; 0.1; 0]; % [dp; dq; dr] rad/s
dt = 0:0.001:5; % sec

% Propagate 5 seconds into the future
x = [];
for t = dt
    x = [x, expm(A*t)*x0];
end

delp = x(1,:)';
delq = x(2,:)';
delr = x(3,:)';

title = sprintf("Propagated Satellite Rate Perturbations - %.0f seconds",
dt(end));

ax = zeros(3,1);
figure
    sgtitle(title)
    ax(1) = subplot(3,1,1);
        plot(dt, delp);
        grid on
        xlabel("\Deltat [sec]")
        ylabel("\Deltap [rad/s]")
    ax(2) = subplot(3,1,2);
        plot(dt, delq);
        grid on
        xlabel("\Deltat [sec]")
        ylabel("\Deltaq [rad/s]")
    ax(3) = subplot(3,1,3);
        plot(dt, delr);
        grid on
        xlabel("\Deltat [sec]")
        ylabel("\Deltar [rad/s]")
    linkaxes(ax, 'x')
```



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