Problem 2

CODE:

```
% PROBLEM 2


% Clear workspace
close all
clear
clc


% Define the system matrices
Ap = [3, 1; -2, 2];
Bp = [0; 1];
Cp = [3, 1];
Dp = [0; 1];
Mp = [1, 0];
By = 1;
Dy = 2;
Bz = 0;
Dz = 2;
Ac = -4;
Bc = 2;
Cc = 1;
Dc = -2;


% Closed loop system equations
fprintf(['xdot_cl = A_cl*x_cl + B_cl*w\n' ...
    'y = C_cl*x_cl + D_cl*w\n' ...
    'where,']);
A_cl = [Ap+Bp*Dc*Mp, Bp*Cc; Bc*Mp, Ac]
B_cl = [Dp+Bp*Dc*Dz; Bc*Dz]
C_cl = [Cp+By*Dc*Mp, By*Cc]
D_cl = Dy+By*Dc*Dz


% Check the stability by computing the eigenvalues of A_cl
eigenvalues = eig(A_cl);


% Check if all eigenvalues have negative real parts
if all(real(eigenvalues) < 0)
    disp('The closed-loop system is stable.');
else
```

```
    disp('The closed-loop system is not stable.');
end


% Calculate the H-infinity norm
h_inf_norm = hinfnorm(ss(A_cl, B_cl, C_cl, D_cl));
disp(['The H-infinity norm of the closed-loop system is: ' num2str(h_inf_norm)]);
```

OUTPUT:

```
xdot_cl = A_cl*x_cl + B_cl*w
y = C_cl*x_cl + D_cl*w
where,
A_cl = 3×3
     3     1     0
    -4     2     1
     2     0    -4
B_cl = 3×1
     0
    -3
     4
C_cl = 1×3
     1     1     1
D_cl = -2
The closed-loop system is not stable.
The H-infinity norm of the closed-loop system is: Inf
```

SCREENSHOT: