

```

clear all;
clc;
clf;

%%%%%%%%%%%%%
% Parameters %
%%%%%%%%%%%%%

F0 = 1; % force amplitude
m = 1; % mass
omega0 = 1; % natural frequency
% beta = 0.2; % damping parameter (for first plotting ↵
sequence)
beta = [.01:.05:.301]; % damping parameter (for second plotting sequence)
omegal = sqrt(omega0^2 - beta.^2); % system's frequency
omegaR = sqrt(omega0^2 - 2*beta.^2); % resonance frequency
omega = [0.01:.01:3.01]; % force's frequency

%%%%%%%%%%%%%
% Plotting 1 %
%%%%%%%%%%%%%

% for q = 1:length(omega)
%     delta(q) = atan(2*omega(q)*beta/(omega0^2-omega(q)^2)); % particular ↵
solution's phase
%     if delta(q) < 0
%         delta(q) = pi + delta(q);
%     end
%     D(q) = F0/m/sqrt((omega0^2-omega(q)^2)^2+4*omega(q)^2*beta^2); % particular ↵
solution's amplitude
% end
%
% % initial conditions x(0) = 1 and v(0) = 0
% for q = 1:length(omega)
%     A(q) = sqrt(((beta-beta*D(q))*cos(delta(q))-D(q)*omega(q)*sin(delta(q)))/omegal)^2+(1-D(q)*cos(delta(q)))^2;
%     delta1(q) = acos((1-D(q)*cos(delta(q)))/A(q));
% end

% t = [0:.01:100];

% for n=1:size(t,2)
%     for q = 1:length(omega)
%         xh(n,q) = A(q)*exp(-beta*t(n))*cos(omegal*t(n)-delta1(q));
%         xp(n,q) = D(q)*cos(omega(q)*t(n)-delta(q));
%         x(n,q) = xh(n,q) + xp(n,q);
%         F(n,q) = F0*cos(omega(q)*t(n));
%     end
% end

% subplot(5,1,1)
% plot(t,x(:,3),t,F(:,3),'LineWidth',2)
% axis([0 30 -5 5])
% grid on
% hold on

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% subplot(5,1,2)
% plot(t,x(:,7),t,F(:,7),'LineWidth',2)
% axis([0 30 -5 5])
% grid on
% hold on
% subplot(5,1,3)
% plot(t,x(:,10),t,F(:,10),'LineWidth',2)
% axis([0 30 -5 5])
% grid on
% hold on
% subplot(5,1,4)
% plot(t,x(:,12),t,F(:,12),'LineWidth',2)
% axis([0 30 -5 5])
% grid on
% hold on
% subplot(5,1,5)
% plot(t,x(:,21),t,F(:,21),'LineWidth',2)
% axis([0 30 -5 5])
% grid on
% hold on

%%%%%%%%%%%%%
% Plotting 2 %
%%%%%%%%%%%%%

for q = 1:length(omega)
    for k = 1:length(beta)
        delta(q,k) = atan(2*omega(q)*beta(k) / (omega0^2-omega(q)^2)); %particular ↴
solution's phase
        if delta(q,k) < 0
            delta(q,k) = pi + delta(q,k);
        end
        D(q,k) = F0/m/sqrt((omega0^2-omega(q)^2)^2+4*omega(q)^2*beta(k)^2); % ↴
particular solution's amplitude
    end
end
subplot(3,1,1);
plot(omega,D,'LineWidth',2)
axis([0 3 0 20])
grid on
subplot(3,1,2);
plot(omega,delta,'LineWidth',2)
axis([0 3 0 3.15])
grid on
subplot(3,1,3);
beta = [.001:.01:.701];
omegaR = sqrt(omega0^2 - 2*beta.^2); % resonance frequency
Q = omegaR/2./beta; % quality factor
plot(beta,Q,'LineWidth',2)
axis([0 1 0 10])
grid on
```