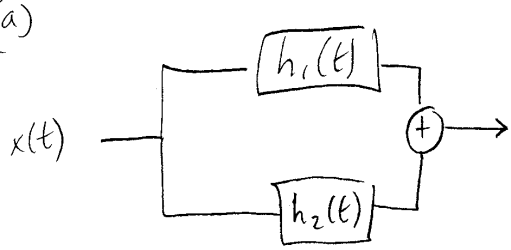
(1) Text, 12-1

$$h_1(t) = 3e^{-10t}u(t) \longleftrightarrow H_1(f) = \frac{3}{j2\pi f + 10}$$

$$h_2(t) = \delta(t) - 3e^{-10}u(t) \longleftrightarrow 1 - \frac{3}{j2\pi f + 10} = H_2(f)$$

(a)

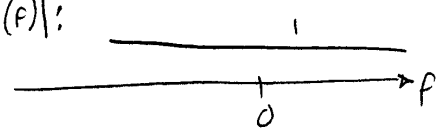


$$\longrightarrow y(t) = x(t) * [h_1(t) + h_2(t)]$$

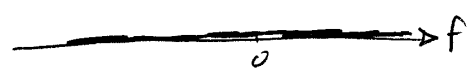
so overall $h(t) = h_1(t) + h_2(t) = \delta(t)$

$$H(f) = 1$$

$|H(f)|$:



$\angle H(f)$



(b) $x(t) \longrightarrow \boxed{h_1(t)} \longrightarrow \boxed{h_2(t)} \longrightarrow y(t) = [h_1(t) * h_2(t)] * x(t)$

so $h_{\text{overall}}(t) = h_1(t) * h_2(t)$

$$H(f) = H_1(f)H_2(f) = \left(\frac{3}{j2\pi f + 10}\right)\left(1 - \frac{3}{j2\pi f + 10}\right)$$

$$= \left(\frac{3}{j2\pi f + 10}\right)\left(\frac{j2\pi f + 10 - 3}{j2\pi f + 10}\right) = \frac{3(j2\pi f + 7)}{(j2\pi f + 10)^2}$$

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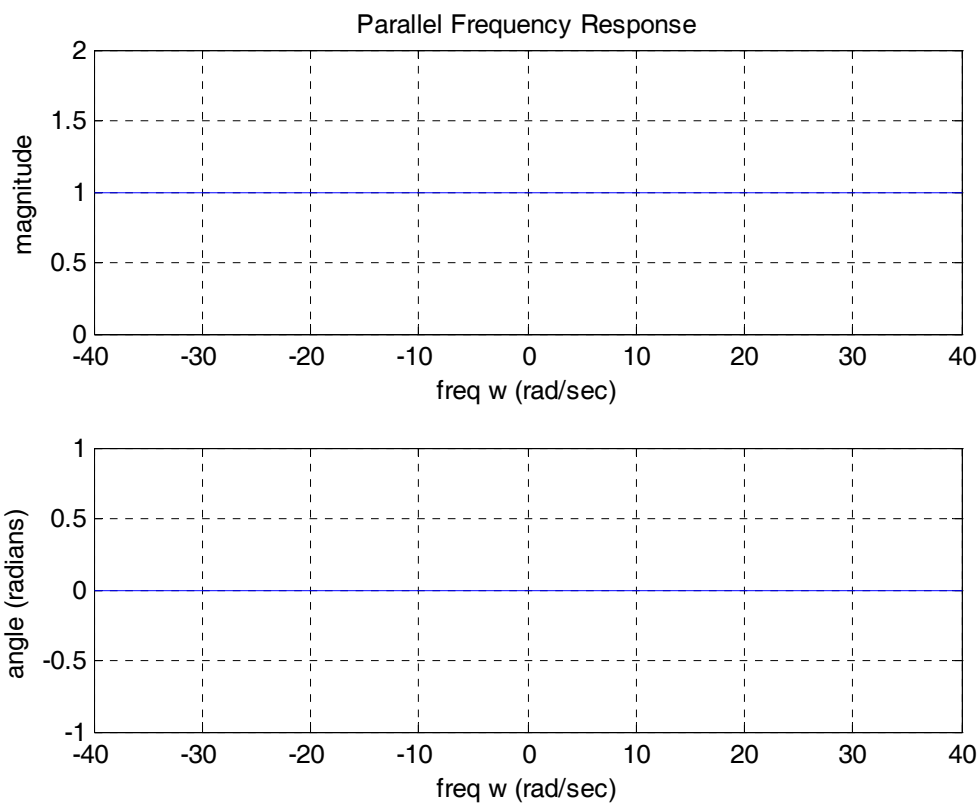
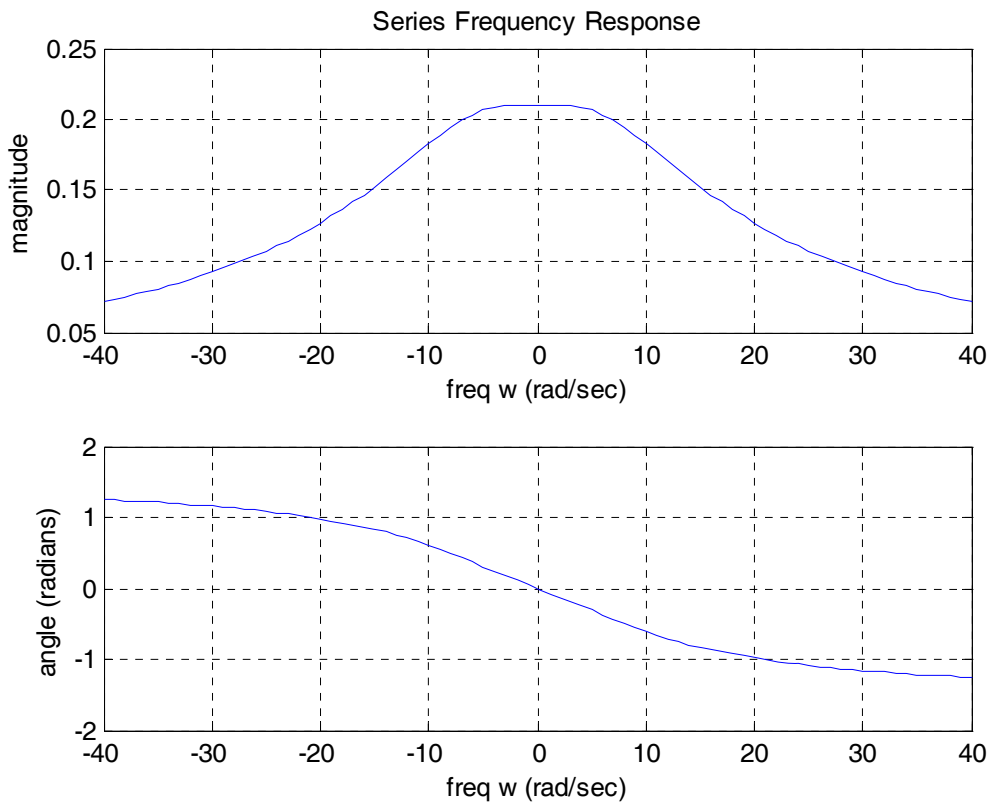
% EE322 Fall 2008 PS32 solutions
% Text, 12-1(a)

w=-40:1:40;
Hp=ones(size(w));
figure(1),subplot(2,1,1),plot(w,abs(Hp)),xlabel('freq w
(rad/sec)'),ylabel('magnitude'),title('Parallel Frequency Response'),grid on
subplot(2,1,2),plot(w,angle(Hp)),xlabel('freq w (rad/sec)'),ylabel('angle
(radians)'),grid on

w=-40:1:40;  % recall that w=2*pi*f
Hs=3*(j*w+7)./(j*w+10).^2;
figure(2),subplot(2,1,1),plot(w,abs(Hs)),xlabel('freq w
(rad/sec)'),ylabel('magnitude'),title('Parallel Frequency Response'),grid on
subplot(2,1,2),plot(w,angle(Hs)),xlabel('freq w (rad/sec)'),ylabel('angle
(radians)'),grid on
```




Series Frequency Response
magnitude
0.25
0.2
0.15
0.1
0.05
-40
-30
-20
-10
0
10
20
30
40
freq w (rad/sec)
angle (radians)
2
1
0
-1
-2
-40
-30
-20
-10
0
10
20
30
40
freq w (rad/sec)