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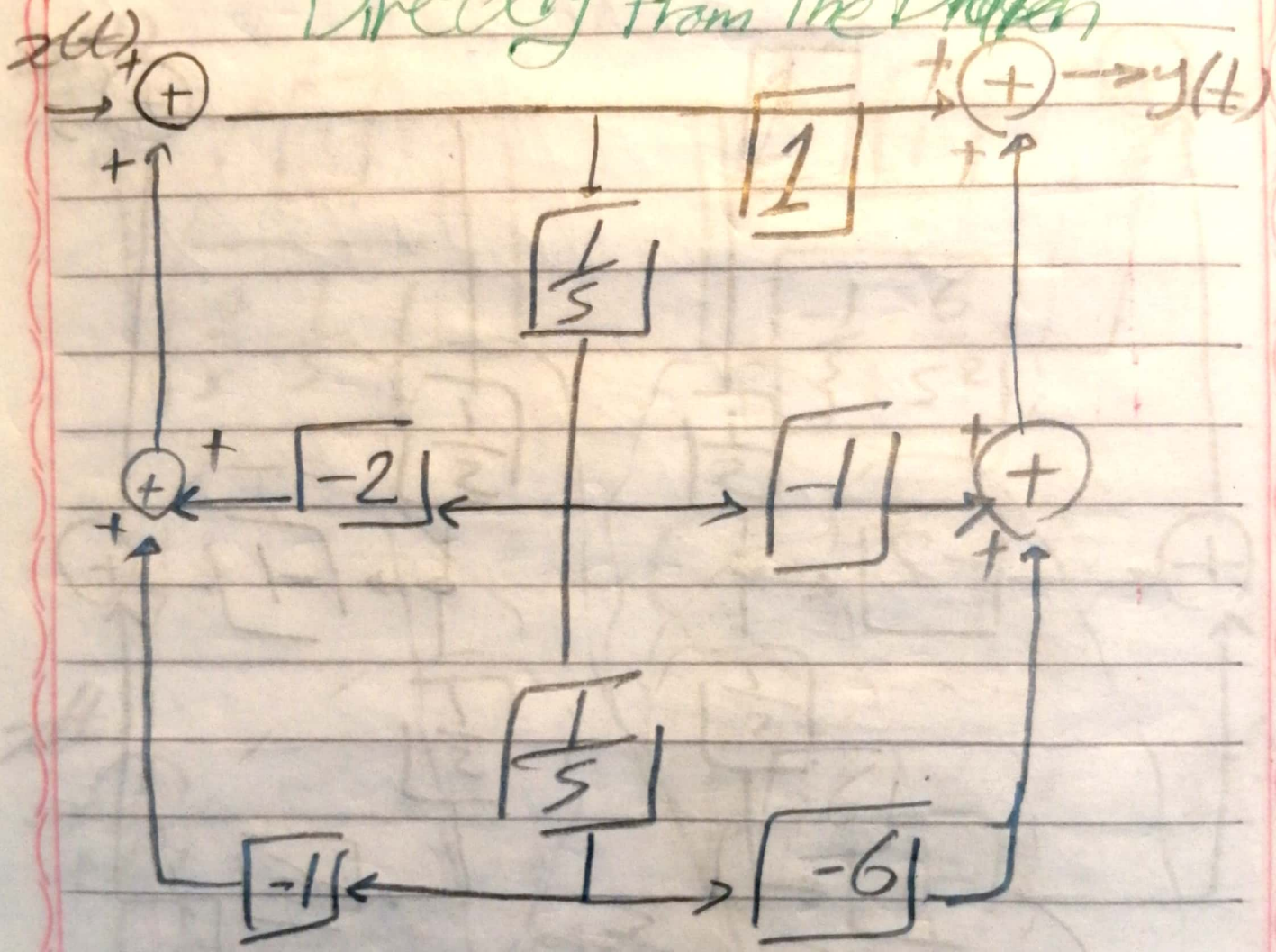
Lec.18 13/12

Directly from the Graph



① x ② $H = \frac{H_{FF}}{H_{FB}}$

$$\frac{H_{FF}}{H_{FB}} = \frac{1 - \frac{1}{s} - \frac{6}{s^2}}{1 + \frac{2}{s} + \frac{1}{s^2}} = \frac{s^2 - s - 6}{s^2 + 2s + 1}$$

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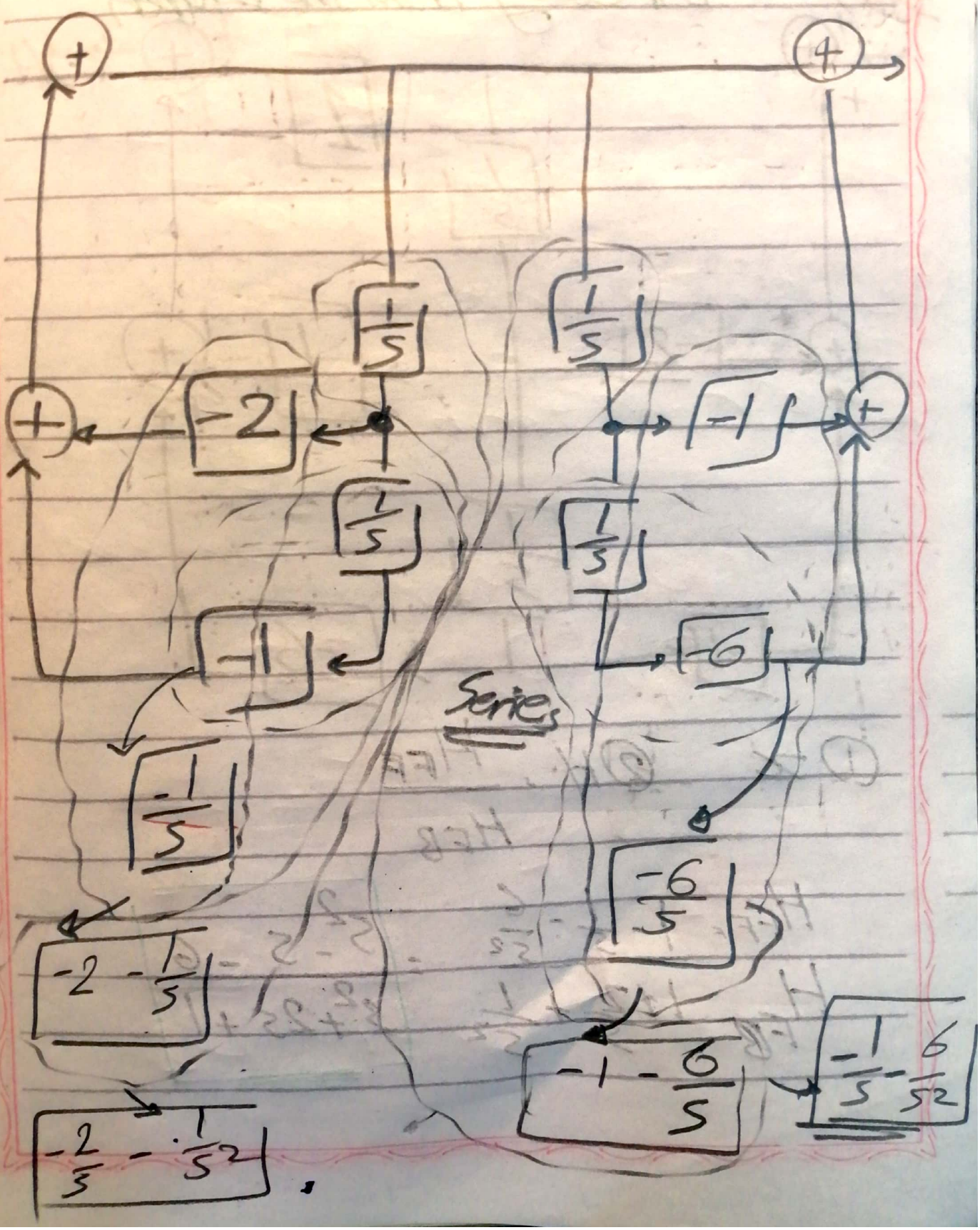
Drawn reduction



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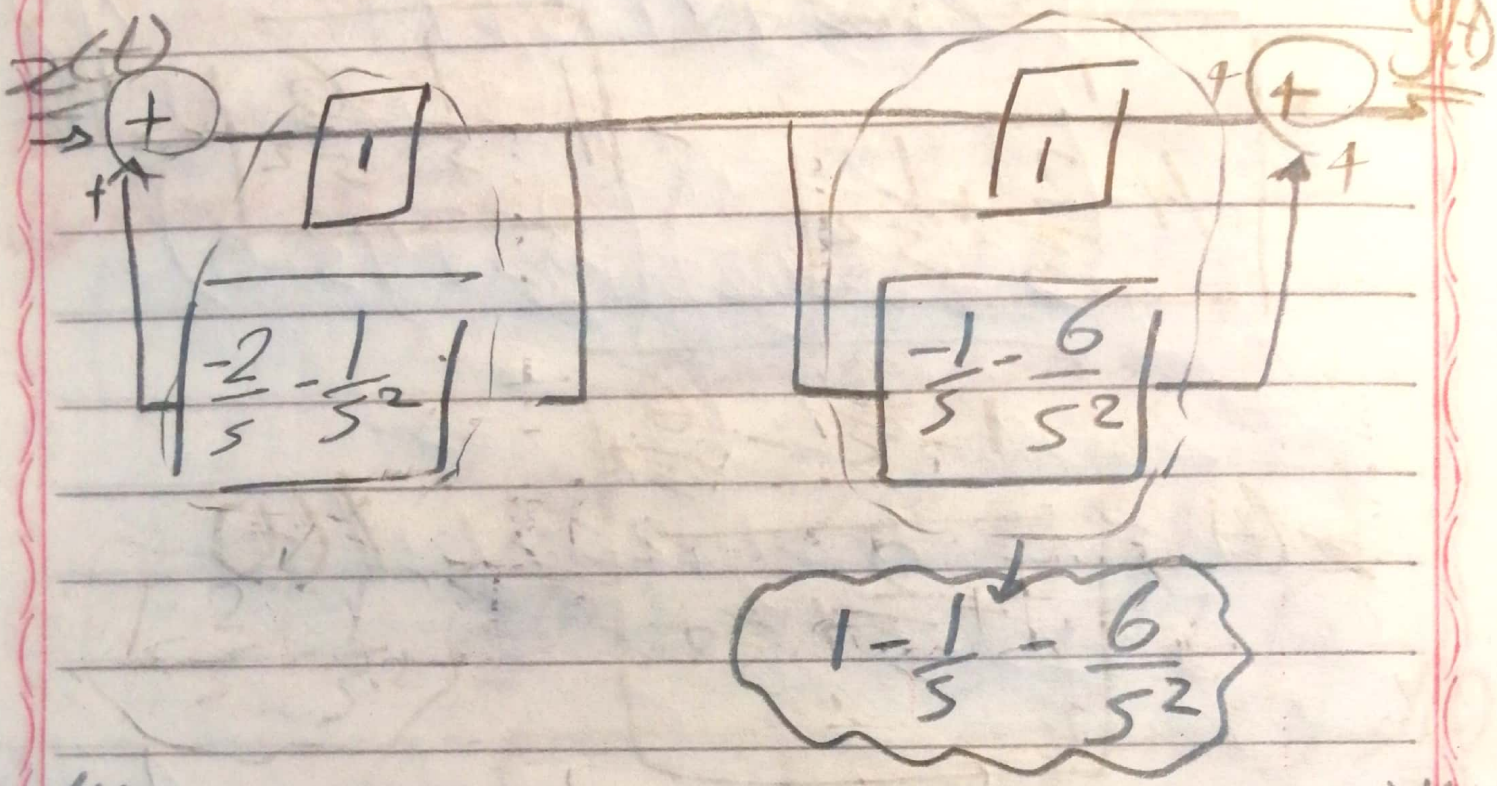
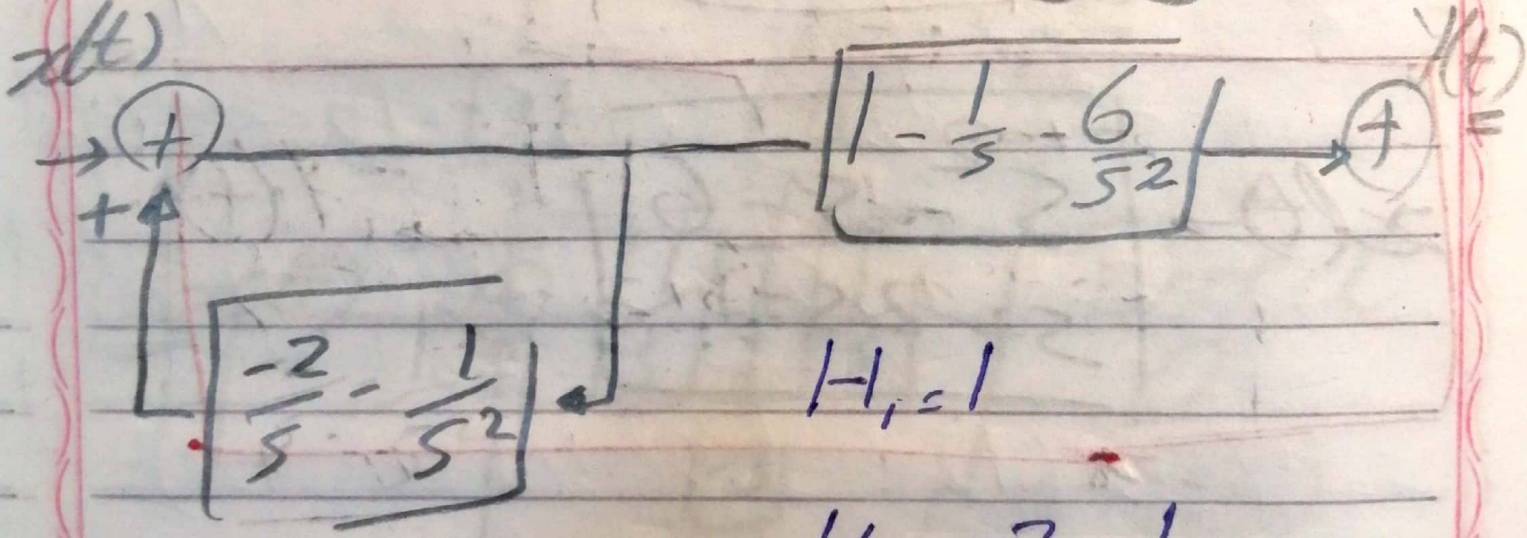
Followed :-



$$1 - \frac{1}{s} - \frac{6}{s^2}$$



$$H_1 = 1$$

$$H_2 = \frac{-2}{s} - \frac{1}{s^2}$$

$$H = \frac{H_1}{1 - H_1 H_2} = \frac{1}{1 - \frac{-2}{s} + \frac{-1}{s^2}}$$

$$= \left(\frac{1}{1 + \frac{2}{s} + \frac{1}{s^2}} \right)$$

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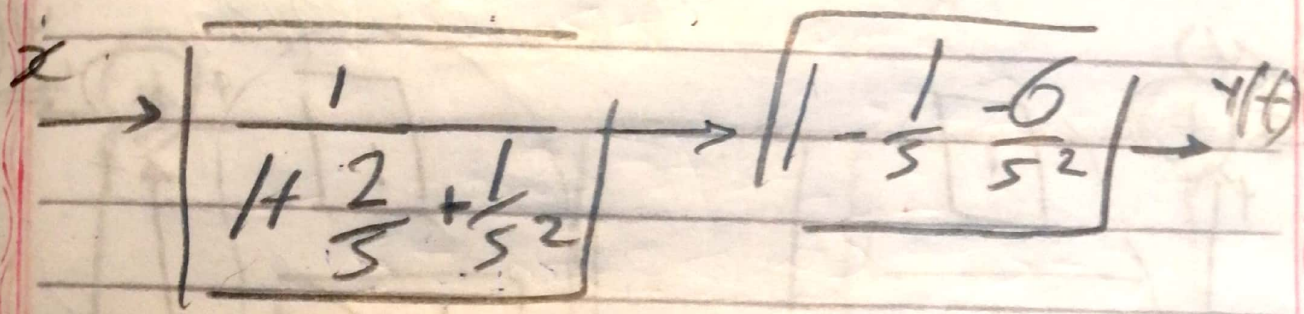
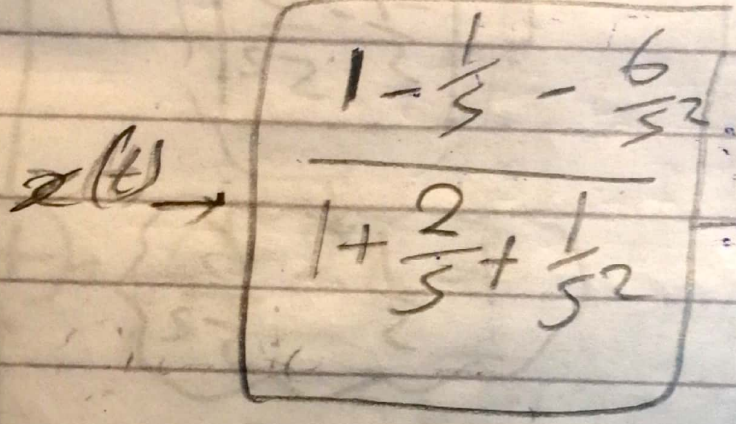
Final Graph:





$$x(t) \rightarrow \left| \frac{s^2 - s - 6}{s + 2s + 1} \right| \rightarrow y(t)$$

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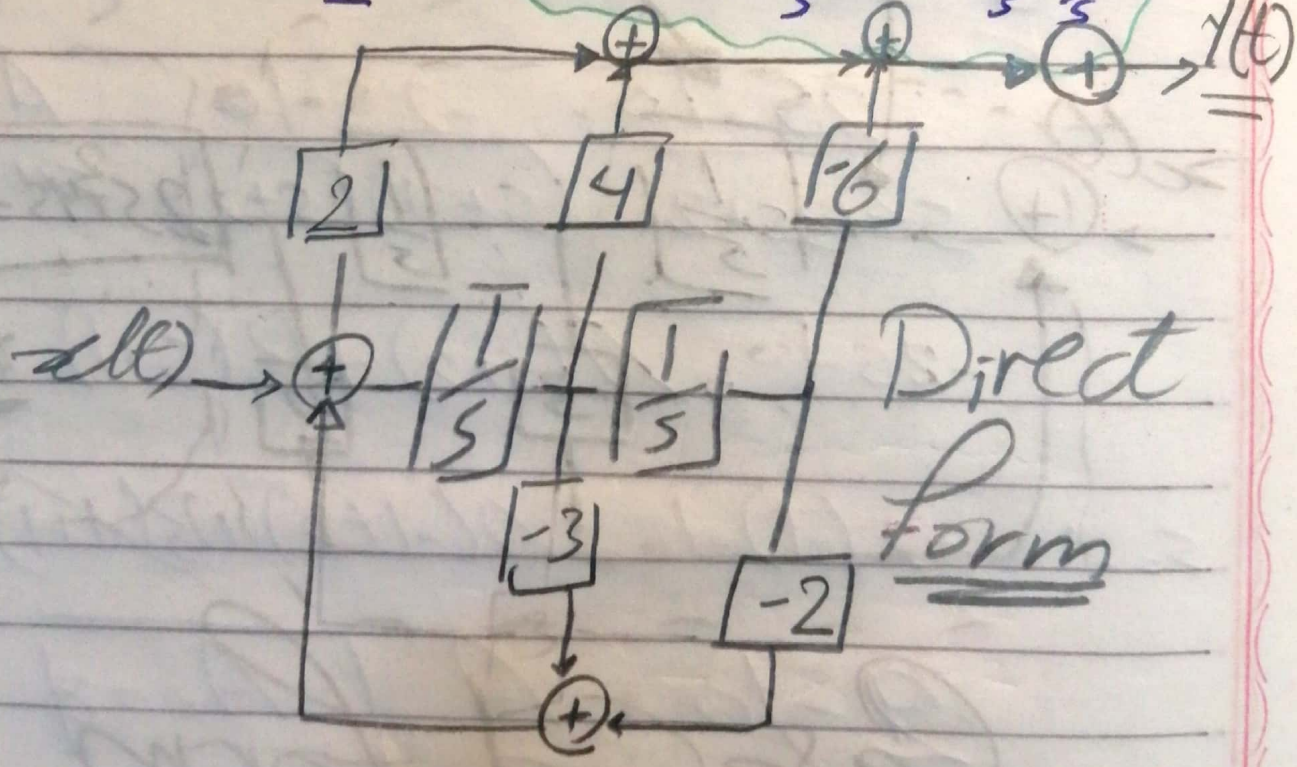
$$H(s) = \frac{4s^2 + 8s - 12}{2s^2 + 6s + 4}$$

1. Direct form
2. Cascade form
3. Parallel form

$$= \frac{4 + 8\cdot\frac{1}{s} - 12\cdot\frac{1}{s}\cdot\frac{1}{s}}{2 + 6\cdot\frac{1}{s} + 4\cdot\frac{1}{s}\cdot\frac{1}{s}}$$

divide by 2 to be 1

$$\frac{Y(s)}{X(s)} = \frac{2 + 4\cdot\frac{1}{s} - 6\cdot\frac{1}{s}\cdot\frac{1}{s}}{1 + 3\cdot\frac{1}{s} + 2\cdot\frac{1}{s}\cdot\frac{1}{s}}$$



Direct form

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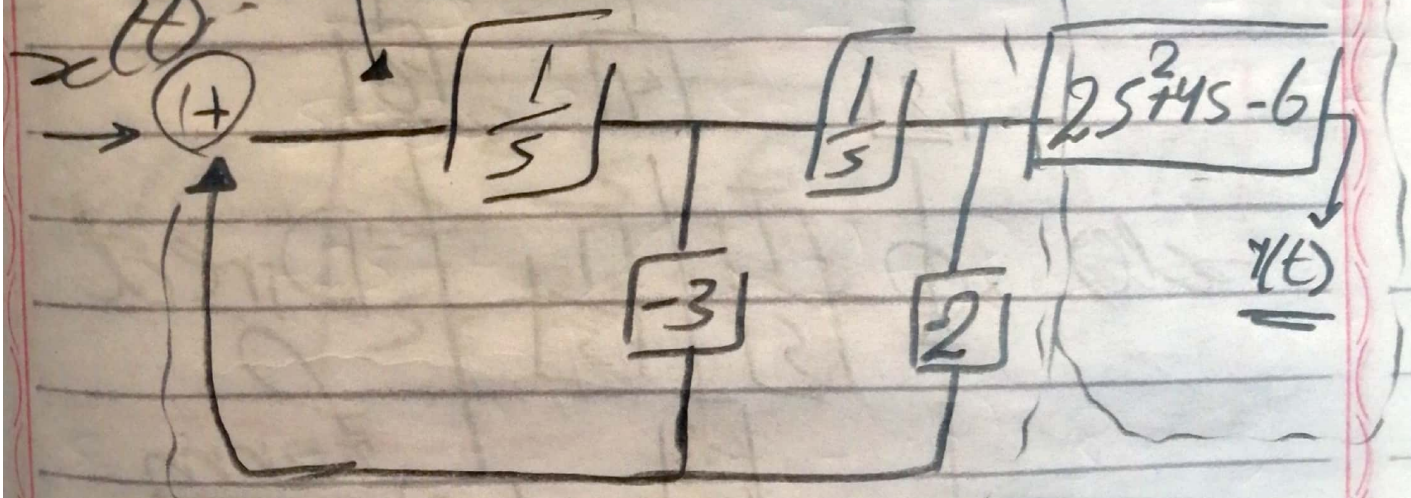
$$H(s) = \left(\frac{1}{2s^2+6s+4}\right)\cdot\left(4s^2+8s-12\right)\left(s^2+2s-3\right)$$

$$= \left(\frac{1}{s^2+3s+2}\right)\left(2s^2+4s-6\right)$$

$$= \frac{\frac{1}{s}\cdot\frac{1}{s}}{1+3\cdot\frac{1}{s}+2\cdot\frac{1}{s}\cdot\frac{1}{s}}$$



Cascad form

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$$\frac{1}{(s+1)(s+2)} \cdot 2(s-1)(s+3)$$

$$\frac{1}{s+1} \quad \frac{-1}{s+2} \cdot 2 \cdot (s-1) \cdot (s+3)$$

$$\frac{1}{1+\frac{1}{s}} \qquad \frac{1}{1+2\frac{1}{s}}$$

$$H(s) = \frac{2s^2+8s-12}{2s^2+6s+4}$$

$$= \frac{2s^2+4s-6}{s^2+3s+2}$$

$$s^2+3s+2 \;\overline{)\; 2s^2+4s-6}$$

$$2s^2+6s+4$$

$$0 \quad -2s-10$$

$$= 2 + \frac{-2s-10}{s^2+3s+2}$$

$$\frac{-2s-10}{s^2+3s+2} = \frac{-2s-10}{(s+1)(s+2)} = \frac{A}{s+1} + \frac{B}{s+2}$$

$$-2s-10 = A(s+2) + B(s+1)$$

$s = -1$ $\quad -2(-1)-10 = A(-1+2) + B(-1+1)$

$$2-10 = A \quad | \; A = -8$$

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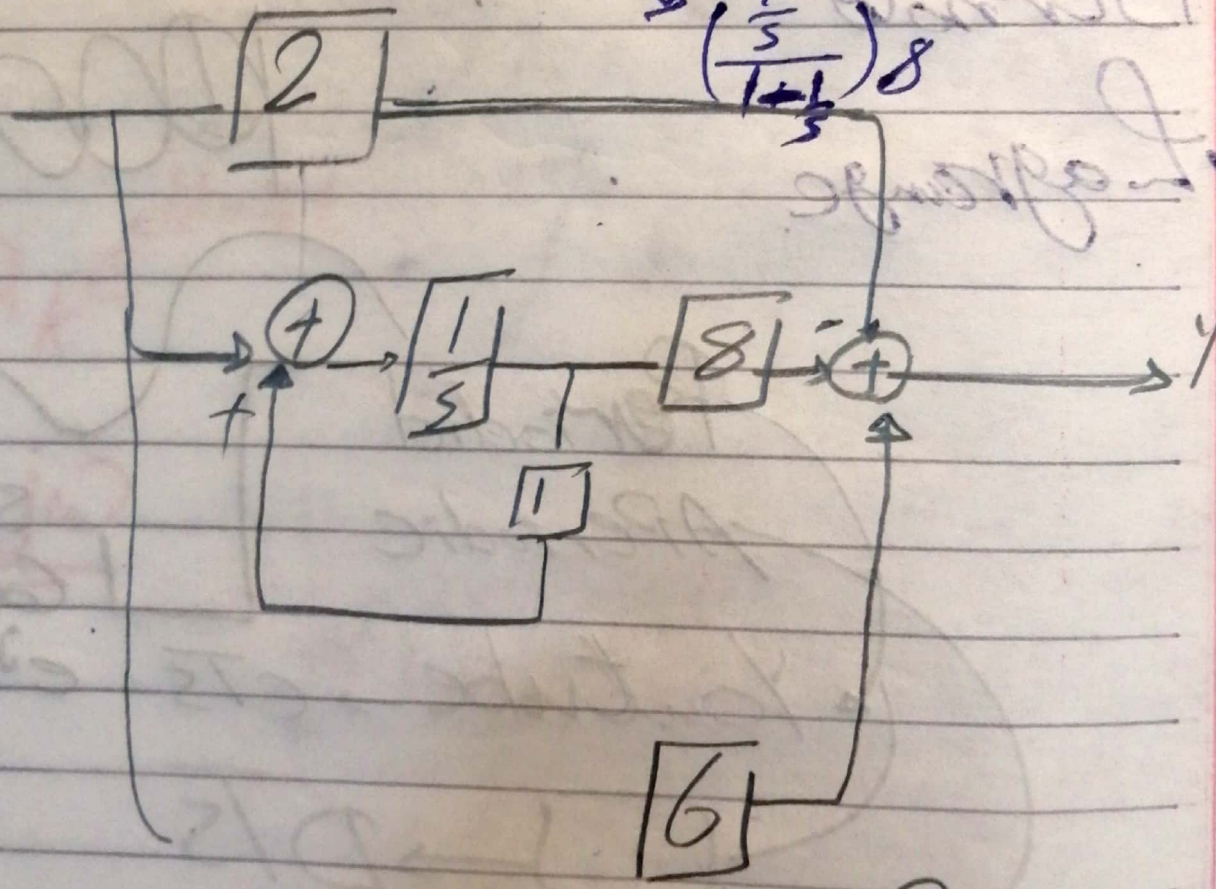
$s = -2 \quad -2(-2) - 10 = A(-2+2) + B(-2+1)$

$4 - 10 = -B \quad [\therefore B = 6]$

$$H(s) = 2 + \left(\frac{8}{s+1}\right) + \frac{6}{s+2}$$

$\left(\frac{8}{s+1}\right) \rightarrow \left(\frac{\frac{1}{s}}{1+\frac{1}{s}}\right)8$



Parallel form

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F T

Baby.

Euler

Bernoli

Lagrange

$\sum (\sin + \cos) e^{j\theta}$

T

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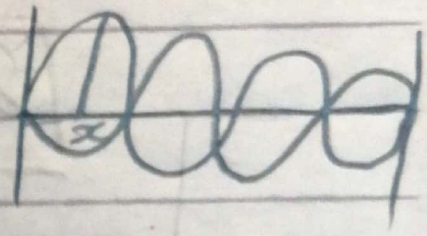

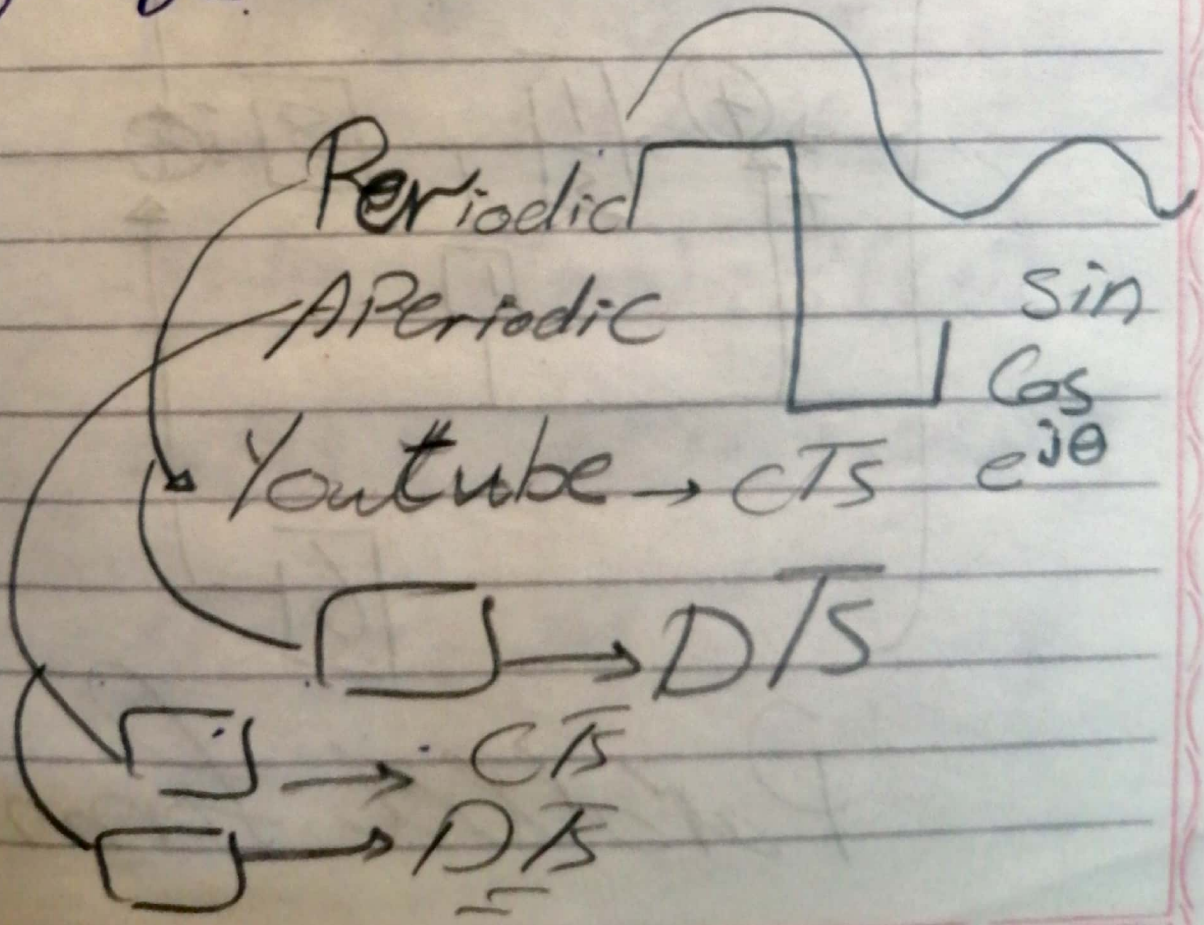

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$$x(t) = \sum_k a_k e^{jk\omega_0 t}$$

LTI

$H(s)$ $\qquad x(t) = e^{st}$

$$y(t) = \int_{-\infty}^{+\infty} h(\tau)\, x(t-\tau)\, d\tau$$

$$\sum a_k e^{jk\omega_0 t} = \int_{-\infty}^{+\infty} h(\tau)\, e^{s(t-\tau)}\, d\tau$$

$s = j\omega$

$$e^{st} e^{-s\tau}$$

$$y(t) = e^{st} \int_{-\infty}^{+\infty} h(\tau) e^{-s\tau}\, d\tau$$

$$= e^{st} H(s)$$