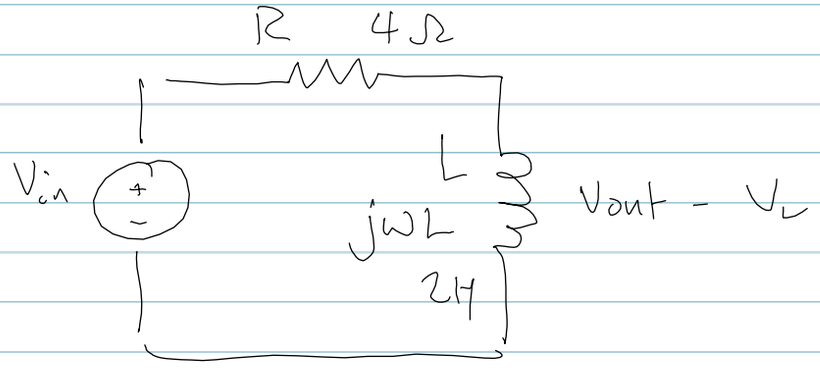
Example 2



$$V_{out}(\omega) = \frac{j2\omega}{4 + j2\omega} V_{in}(\omega)$$

$$= \frac{j\omega}{j2\omega + 1} \quad \frac{j\omega}{j\omega + 2}$$

$$H(\omega) = \frac{V_{out}}{V_{in}} = \frac{j\omega}{j2\omega + 1} \quad \frac{j\omega}{j\omega + 2}.$$

$$V_{in}(t) = 5e^{-3t}\, u(t)$$

$$V_{in}(\omega) \Leftrightarrow \frac{5}{j\omega + 3}.$$

$$V_{out}(\omega) = \frac{j\omega}{j\omega + 2} \cdot \frac{5}{j\omega + 3} = \frac{r_1}{j\omega + 2} + \frac{r_2}{j\omega + 3}$$

$$r_1 = -10 \qquad r_2 = +15$$

$$V_{out}(\omega) = \frac{15}{j\omega + 3} - \frac{10}{j\omega + 2}$$

$$V_L(t) = V_{out}(t) = \mathcal{F}^{-1}\left\{\frac{15}{j\omega+3} - \frac{10}{j\omega+2}\right\}$$

$$= 15e^{-3t}u_0(t) - 10e^{-2t}u_0(t)$$

$$= \left[15e^{-3t} - 10e^{-2t}\right]u_0(t).$$