

$$\frac{d^2 y}{dt^2} + y = \sin(2t), \text{ com } y(0) = 2 \text{ e } \frac{dy(0)}{dt} = 1$$

$$s^2 Y(s) - sy(0) - y'(0) + Y(s) = \frac{2}{s^2 + 4}$$

$$Y(s)(s^2 + 1) - 2s - 1 = \frac{2}{s^2 + 4}$$

$$Y(s)(s^2 + 1) = \frac{2}{s^2 + 4} + 2s + 1 \Rightarrow Y(s)(s^2 + 1) = \frac{2 + (s^2 + 4)(2s + 1)}{s^2 + 4}$$

$$Y(s) = \frac{2 + (s^2 + 4)(2s + 1)}{(s^2 + 4)(s^2 + 1)} = \frac{2 + 2s^3 + s^2 + 8s + 4}{(s^2 + 4)(s^2 + 1)}$$

$$Y(s) = \frac{2s^3 + s^2 + 8s + 6}{(s^2 + 4)(s^2 + 1)}$$

$$H(s) = \frac{Y(s)}{X(s)} \sim \frac{\text{saída}}{\text{entrada}}$$

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

$$H(s) = \frac{2s^3 + s^2 + 8s + 6}{2(s^2 + 1)}$$