Lecture 28

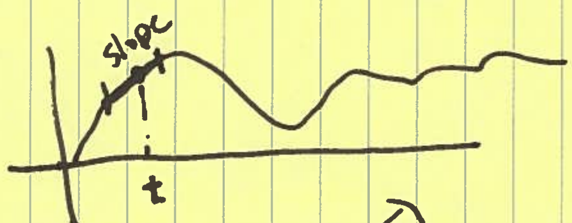
Approximating a Derivative:

$$x(t) \rightarrow \boxed{\frac{d}{dt}} \rightarrow y(t)$$

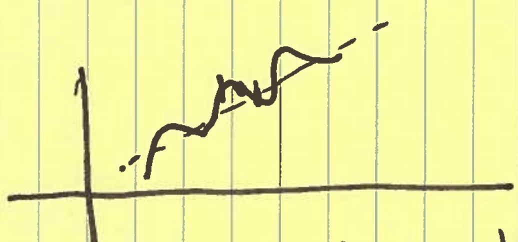
$$H(\omega) = j\omega$$

infinite!

Reasonable discrete-time approximation?



$$\frac{d}{dt} \approx \frac{x(n) - x(n-T)}{T}$$



no need to constrain ourselves to a first-order difference

$$H(s) = \frac{b}{s+a} = \frac{Y(s)}{X(s)}$$

$$Y(s)[s+a] = X(s)\,b$$

$$sY(s) + aY(s) = X(s)\,b$$

$$Y(s) = -\frac{1}{a} sY(s) + \frac{b}{a} X(s)$$

$$y(t) = -\frac{1}{a}\frac{dy(t)}{dt} + \frac{b}{a} x(t)$$