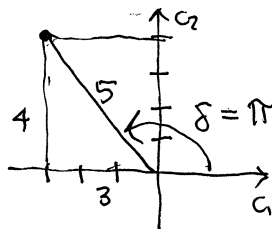


exponentially modulated sinusoidal functions: example

$$S(t) = e^{-2t} (-3 \cos 5t + 4 \sin 5t)$$

$$k=2 \rightarrow \tau = \frac{1}{2}$$

decay window
 $t = 0 \dots 5\tau$
 $= 0 \dots 2.5$



$(-3, 4)$

$$\omega = 5 \rightarrow T = \frac{2\pi}{5} \approx 1.26$$

$$\frac{5\tau}{T} \approx \frac{2.5}{1.26} \approx 1.99$$

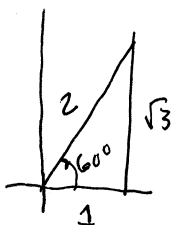
so about 2 cycles of oscillation are visible in a decay window $t = 0 \dots 5\tau$

$$\frac{\delta}{2\pi} \approx 0.352 \text{ cycles}$$

$\delta = \pi - \arctan \frac{4}{3} \approx 2.21$
 (127°)
 $\approx \frac{1}{3} \text{ cycle}$

previous handout sheet

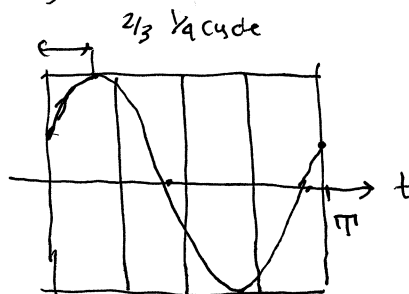
$$y = \cos \omega t + \sqrt{3} \sin \omega t = 2 \cos(\omega t - \frac{\pi}{3})$$



$$A = 2$$

$$\delta = \frac{\pi}{3}$$

$$T = \frac{2\pi}{\omega}$$



$$r = -2 \pm 5i, e^{rt} = e^{-2t} e^{\pm 5it} = e^{-2t} (\cos 5t \pm i \sin 5t)$$

$$(r - (-2+5i))(r - (-2-5i)) = r^2 + 4r + (4+25) = r^2 + 4r + 29$$

$$y'' + 4y + 29y = 0$$

$$\omega_0^2 = 29 \quad \omega_0 = \sqrt{29} \approx 5.4$$

$$k_0 = 4$$

$$\tau_0 = \frac{1}{4}$$

see maple worksheet

