

Mistake:

Why these mistakes happened / How to avoid?

Mixed up the damped responses A & C which made the explanations incorrect as well.

I didn't understand how $\omega - \omega_0$ affected the amplitude and basically took a wild guess. I now understand the concepts behind why the graphs correspond to each equation and am better equipped to avoid the same mistakes in the future.

Corrected Solution:

$$y'' + y' + 25y = \cos(5t) \quad \omega = 5 \quad \omega_0 = \sqrt{\frac{k}{m}} = \sqrt{\frac{25}{1}} = 5$$

Graph: A

Since $\omega - \omega_0 = 0$ (they are close/the same even) this will result in a large amplitude like seen in graph A.

$$y'' + y' + 25y = \cos(t) \quad \omega = 1 \quad \omega_0 = \sqrt{\frac{k}{m}} = \sqrt{\frac{25}{1}} = 5 \quad \omega - \omega_0 = 4$$

Graph: C

When ω is far from ω_0 , there is a transient solution that eventually fades away. This can be seen in graph C where the graph starts irregularly but eventually gives way to a normal sinusoidal graph.