Math 321   Class Exercises 2/16/2018   **Names:**

probably could tell for sure if we solved it → maybe

1. $y'' + 5y' + 4y = t^2 + 3t$ Forced? (y) n   System damping: __overdamped__

Response has transient part? (y) n   steady-state part? (y)(n) *solved it*

Form of response (solution): $y = C_1 e^{r_1 t} + C_2 e^{r_2 t} + At^2 + Bt + C$

$\underbrace{\phantom{C_1 e^{r_1 t} + C_2 e^{r_2 t}}}_{transient}$ $\underbrace{}_{\substack{neither\ trans\\ nor\ steady\text{-}state}}$ $\underbrace{}_{steady\text{-}state}$

2. $y'' + 5y' + 4y = 0$ Forced? y (n)   System damping: __overdamped__

Response has transient part? (y) n   steady-state part? y (n)

Form of response (solution): $y = C_1 e^{r_1 t} + C_2 e^{r_2 t}$

3. $y'' + 4y = 5\cos 5t$ Forced? (y) n   System damping: __undamped__

Response has transient part? y (n)   steady-state part? (y) n

Form of response (solution): $y = C_1 \sin\lambda t + C_2 \cos\lambda t + A\sin\omega t + B\cos\omega t$ $\left(\begin{smallmatrix}\lambda = 2\\ \omega = 5\end{smallmatrix}\right)$

4. $y'' + 2y' + 5y = \sin t$ Forced? (y) n   System damping: __under-damped__

Response has transient part? (y) n   steady-state part? (y) n $\left(\begin{smallmatrix}\lambda = ч\\ \omega = 1\end{smallmatrix}\right)$

Form of response (solution): $y = e^{kt}\left(C_1 \sin\lambda t + C_2 \cos\lambda t\right) + A\sin\omega t + B\cos\omega t$

5. $y'' + 4y' + 9y = 0$ Forced? y (n)   System damping: __under-damped__

Response has transient part? (y) n   steady-state part? y (n)

Form of response (solution): $y = e^{kt}\left(C_1 \sin\lambda t + C_2 \cos\lambda t\right)$

6. $y'' + 9y = 0$ Forced? y (n)   System damping: __undamped__

Response has transient part? y (n)   steady-state part? (y) n

Form of response (solution): $y = C_1 \sin\lambda t + C_2 \cos\lambda t$ $(\lambda = 3)$

7. $y'' + 6y' + 9y = 4\sin 3t$ Forced? (y) n System damping: _critically damped_

Response has transient part? (y) n   steady-state part? (y) n

Form of response (solution): $y = C_1 e^{rt} + C_2 t e^{rt} + A\sin\omega t + B\cos\omega t$ $(\omega = 3)$

8. $y'' + 4y' + 5y = 4e^{-3t}$ Forced? (y) n System damping: _under-damped_

Response has transient part? (y) n   steady-state part? y (n)

Form of response (solution): $y = e^{kt}(C_1 \sin\lambda t + C_2 \cos\lambda t) + A e^{bt}$

9. $y'' + y = 6$ Forced? (y) n System damping: _undamped_

Response has transient part? y (n)   steady-state part? (y) n

Form of response (solution): $y = C_1 \sin\lambda t + C_2 \cos\lambda t + C$