

Answer Key for **HW 9****2. [12 pts]****(i) [5 pts]** (1 pt for attempt)

$$y(t) = \frac{8}{16 - \omega^2} (\cos \omega t - \cos 4t) = \frac{16}{16 - \omega^2} \sin\left(\frac{\omega + 4}{2}t\right) \sin\left(\frac{4 - \omega}{2}t\right) \quad (\omega \neq 4)$$

[3 pts]**[1 pt]****(ii) [2 pts]** (1 pt for answer, 1 pt for explanation)

$$\text{Amplitude} = \left| \frac{8}{\omega^2 - 16} \right| \quad \left(\text{'Amplitude is affected by } \frac{8}{\omega^2 - 16} \text{' is also acceptable} \right)$$

(16 - \omega^2 instead of \omega^2 - 16 is also acceptable)

(iii) [1 pt] \omega \rightarrow 4 (\omega \rightarrow -4, \omega \rightarrow \pm 4 are also acceptable)**(iv) [1 pt]** Decreases ('approaches to 0' is also acceptable)**(v) [3 pts]** (.5 pts for attempt) y(t) = t \sin 4t**4. [11 pts]****(i) [3 pts]** (.5 pts for attempt)

$$y(t) = \frac{1}{37} (e^{3t} + 216e^{-3t} \sin t + 36e^{-3t} \cos t)$$

(ii) [3 pts] (.5 pts for attempt)

$$y(t) = \frac{2}{39} \cos t (e^{-3t} - 1) + \frac{1}{13} \sin t (e^{-3t} + 1) \quad \left(= \left(\frac{\sin t}{13} - \frac{2 \cos t}{39} \right) + e^{-3t} \left(\frac{\sin t}{13} + \frac{2 \cos t}{39} \right) \right)$$

(iii) [3 pts] (.5 pts for attempt)

$$y_p(t) = -\frac{1}{2} e^{-3t} t \cos t$$

(iv) [2 pts] (.5 pts for attempt)

$$y(t) = \frac{e^{3t}}{37} + \frac{t}{10} - \frac{3}{50}$$

7. [7 pts] (1 pt for attempt)

$$y_p(t) = \frac{1}{2} t e^{-3t} \{ \cos t + (t + 1) \sin t \} \quad \left(= \frac{1}{2} e^{-3t} t^2 \sin t + \frac{1}{2} e^{-3t} t \sin t + \frac{1}{2} e^{-3t} t \cos t \right)$$