7. Find the general solution of the given differential equation:

$$y'' + 3y' + 2y = \cos(t)$$

8. What is the *transient solution*? What is the *steady state solution*? (See section 3.8)

9. Pictured below are the graphs of several solutions to the differential equation:

$$y'' + by' + cy = \cos(\omega t)$$

Match the figure to the choice of parameters:

| Choice | $b$ | $c$ | $\omega$ |
|---|---|---|---|
| $(A)$ | 5 | 3 | 1 |
| $(B)$ | 1 | 3 | 1 |
| $(C)$ | 5 | 1 | 3 |
| $(D)$ | 1 | 1 | 3 |

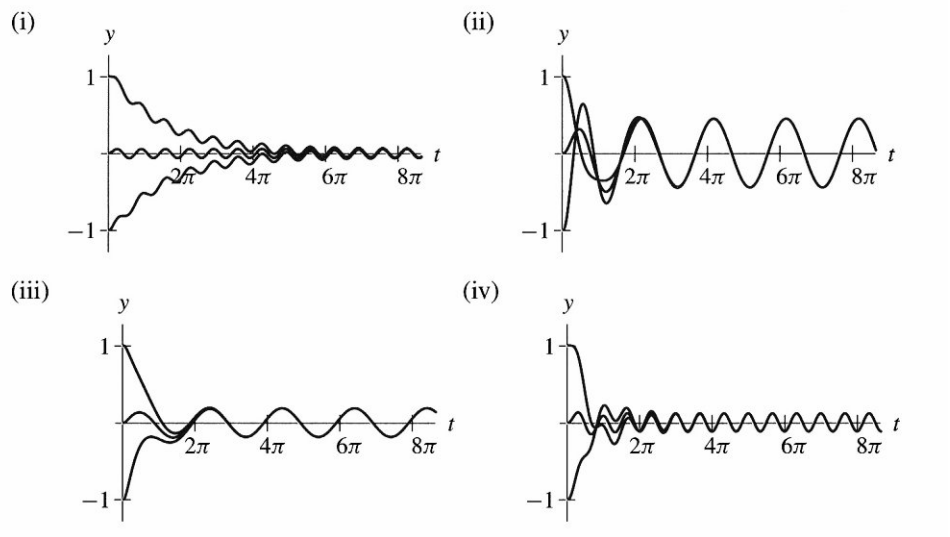


Figure 2: Figures for homework problem 2. Match each figure with the appropriate choice of constants.

10. Recall that

$$\text{Real}(e^{i\theta}) = \cos(\theta) \qquad \text{Imag}(e^{i\theta}) = \sin(\theta)$$

Show that, given the DE below we can use the ansatz $y_p = Ae^{3ti}$ (the real part),

$$y'' + 4y = 2\cos(3t)$$

and we will get the particular solution,

$$A = -\frac{2}{5} \qquad \Rightarrow \qquad y_p(t) = -\frac{2}{5}\cos(3t)$$