(4) Find the general solution to $y'' + 5y' + 4y = 0$

(9) Use A and B to denote arbitrary constants an t the independent variable.

- Characteristic polynomial - $r^2 + 5r + 4$

- Roots - $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$= \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(4)}}{2(1)}$$

$$= \frac{5 \pm \sqrt{25 - 16}}{2}$$

$$= \frac{5 \pm \sqrt{9}}{2}$$

$$= \frac{5 + 3}{2} \quad \Big| \quad \frac{5 - 3}{2}$$

$$= +4 \quad \Big| \quad = +1$$

Ans = $\underline{Ae^{4t} + Be^{t}}$

(6) Find the particular solution that satisfies $y(0) = 13$ and $y'(0) = 34$

$A + B = 13$

$y'(t) = Ae^{4t} + Be^{t}\ dt$

$y'(t) = 4Ae^{4t} + Be^{t}$

$y'(0) = 34 = 4Ae^{4t} + Be^{t}$

Set equations equal $\rightarrow$

$A + B = 13 \quad (-4)$

$4A + B = 34$

$\downarrow$

$-4A - 4B = -52$

$4A + B = 34$

$-3B = -18$

$B = \frac{-18}{-3}$

$B = 6$

$A + 6 = 13$

$A = 13 - 6$

$A = 7$

Ans $=$ $\underline{7e^{4t} + 6e^{t}}$