3. $\mathcal{L}^{-1}\left[\frac{7}{s^2+6}\right] = f(t)$

$7\mathcal{L}^{-1}\left[\frac{1}{s^2+6}\right]$ WHERE $w = \sqrt{6}$; $1 = \frac{\sqrt{6}}{\sqrt{6}}$

$7\mathcal{L}^{-1}\frac{\frac{\sqrt{6}}{\sqrt{6}}}{s^2+\sqrt{6}^2} \rightsquigarrow 7\left(\frac{1}{\sqrt{6}}\right)\mathcal{L}^{-1}\frac{\sqrt{6}}{s^2+\sqrt{6}^2}$

$7/\sqrt{6}\ \mathcal{L}^{-1}\frac{\sqrt{6}}{s^2+\sqrt{6}^2}$

$\frac{\sqrt{6}}{\sqrt{6}}\left[7/\sqrt{6}\right]\sin\sqrt{6}\,t\,u(t)$

$$\boxed{f(t) = \frac{7\cdot\sqrt{6}\quad \sin\sqrt{6}\ t}{6}}$$

III. SOLVE FOR THE INVERSE LAPLACE TRANSFORM OF THE FOLLOWING

1. $F(s) = \frac{1}{s(s^2+2s+2)}$

$\left[\frac{1}{s(s^2+2s+2)}\right] = \frac{A}{s} + \frac{Bs+C}{s^2+2s+2}$

$1 = A(s^2+2s+2) + s(Bs+C)$

$1 = A(s^2+2s+2) + Bs^2 + Cs)$

IF $s = 0$; $1 = 2A$

$A = 1/2$

SUBSTITUTING A

$\left[1 = \frac{s^2+2s+2}{2} + Bs^2 + Cs\right]2$

$2 = s^2 + 2s + 2 + 2Bs^2 + 2Cs$

$2 = s^2(2B+1) + s(2C+2) + 2$

$2B+1$ $\qquad$ $2C+2$

$B = -1/2$ $\qquad$ $C = -1$

$\therefore \mathcal{L}^{-1}\frac{1/2}{s} - \frac{1/2\,s+1}{s^2+2s+2}$

$1/2\,\mathcal{L}^{-1}\,1/s - 1/2\,\mathcal{L}^{-1}\frac{s+2}{s^2+2s+2} \rightsquigarrow \frac{1}{2}\mathcal{L}^{-1}\frac{1}{s} - \frac{1}{2}\mathcal{L}^{-1}\frac{s+2}{s^2+2s+1+1}$

$1/2\,\mathcal{L}^{-1}\,1/s - 1/2\,\mathcal{L}^{-1}\frac{(s+1)+1}{(s+1)^2+1}$; WHERE : $a = 1$ & $w = 1$

$$\boxed{f(t) = 1/2 - \frac{e^{-t}\cos t + \sin t}{2}}$$