7.45 247

1) $F(s) = \dfrac{2s^3}{s^4-4} = \dfrac{2s^3}{(s^2+2)(s^2-2)}$

poles at $z = \pm\sqrt{2}, \pm\sqrt{2}i$

$\therefore f(t) = \sum_{n=1}^{4} \operatorname{Res}_{z=z_n} \left[e^{st} F(s) \right] = \sum_{n=1}^{4} \operatorname{Res}_{z=z_n} \frac{2s^3 e^{st}}{s^4-4}$

$= \sum_{n=1}^{4} \frac{P(z)}{Q'(z)} = \sum_{n=1}^{4} z=z_n \left(\frac{2z_n^3 e^{z_n t}}{4z_n^3} \right) = \sum_{n=1}^{4} \frac{1}{2} e^{z_n t}$

$f(t) = \frac{1}{2}\left[e^{\sqrt{2}t} + e^{-\sqrt{2}t} + e^{\sqrt{2}ti} + e^{-\sqrt{2}ti} \right]$

$= \frac{1}{2}\left(e^{\sqrt{2}t} + e^{-\sqrt{2}t} \right) + \frac{1}{2}\left(e^{\sqrt{2}ti} + e^{-\sqrt{2}ti} \right)$

$= \cosh(\sqrt{2}t) + \cos(\sqrt{2}t)$