

$$f(t) = \mathcal{L}^{-1} \left[\frac{1}{p(p^2-1)} \right]$$

$$= \mathcal{L}^{-1} \left[\frac{1}{p(p+1)(p-1)} \right]$$

$$= \frac{1}{2} \mathcal{L}^{-1} \left[\frac{1}{p(p-1)} - \frac{1}{p(p+1)} \right]$$

$$= \frac{1}{2} \mathcal{L}^{-1} \left[\left(\frac{1}{p-1} - \frac{1}{p} \right) - \left(\frac{1}{p} - \frac{1}{p+1} \right) \right]$$

$$= \frac{1}{2} \mathcal{L}^{-1} \left[\frac{1}{p-1} \right] - \mathcal{L}^{-1} \left[\frac{1}{p} \right] + \frac{1}{2} \mathcal{L}^{-1} \left[\frac{1}{p+1} \right]$$

$$= \frac{1}{2} e^t - 1 + \frac{1}{2} e^{-t}$$

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