18.03SC Practice Problems 27

Laplace transform

Solution suggestions

1. *Use the rules and formulas to find the Laplace transform of* $e^{-t}(t^2+1)$.

By linearity and the formulas, the transform of t^2+1 is

$$\mathcal{L}[t^2+1] = \frac{2}{s^3} + \frac{1}{s} = \frac{2+s^2}{s^3}.$$

So, by s-shift, the transform of the entire expression is

$$\begin{aligned}\mathcal{L}[e^{-t}(t^2+1)] &= \frac{2+(s+1)^2}{(s+1)^3} \\ &= \frac{s^2+2s+3}{(s+1)^3}.\end{aligned}$$

18.03SC Differential Equations
Fall 2011