

## Problem 5

In each of Problems 1 through 10, find the inverse Laplace transform of the given function.

$$F(s) = \frac{2s + 2}{s^2 + 2s + 5}$$

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### Solution

Complete the square in the denominator.

$$\begin{aligned} F(s) &= \frac{2s + 2}{s^2 + 2s + 1 + 5 - 1} \\ &= \frac{2s + 2}{(s + 1)^2 + 4} \\ &= 2 \frac{s + 1}{(s + 1)^2 + 4} \end{aligned}$$

Take the inverse Laplace transform to get  $f(t)$ .

$$\begin{aligned} \mathcal{L}^{-1}\{F(s)\} &= \mathcal{L}^{-1}\left\{2 \frac{s + 1}{(s + 1)^2 + 4}\right\} \\ f(t) &= 2\mathcal{L}^{-1}\left\{\frac{s + 1}{(s + 1)^2 + 4}\right\} \\ &= 2e^{-t} \cos 2t \end{aligned}$$