Method of Partial Fractions

Problem: compute $\mathscr{L}^{-1}\left\{\dfrac{s}{(s+1)(s^2+1)}\right\}$

This Laplace transform is not in the tables, but let's look at the table anyway. What do we find?

$$\frac{1}{s+1} \qquad \mathscr{L}^{-1}\left\{\frac{1}{s+1}\right\} = e^{-t} \qquad (\#7)$$

$$\frac{1}{s^2+1} \qquad \mathscr{L}^{-1}\left\{\frac{1}{s^2+1}\right\} = \sin t \qquad (\#17)$$

$$\frac{s}{s^2+1} \qquad \mathscr{L}^{-1}\left\{\frac{s}{s^2+1}\right\} = \cos t \qquad (\#18)$$

— so we see some things that are similar to $Y(s)$, but not quite.

This brings us to the method of partial fractions:

- boring (i.e., character-building), but *very useful*
- allows us to break up complicated fractions into sums of simpler ones, for which we know $\mathscr{L}^{-1}$ from tables