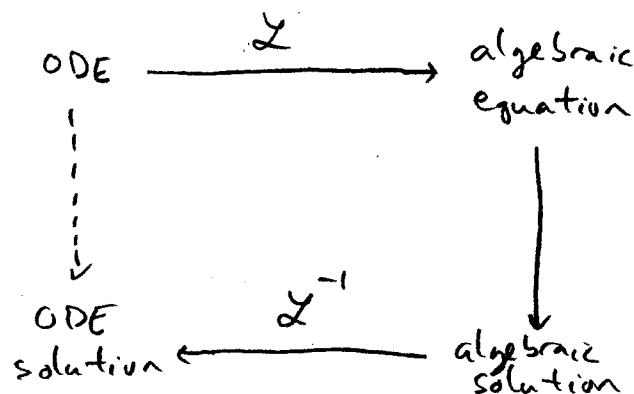


Week 10 summary:

• Laplace transforms: $\mathcal{L}(f)(s) = \int_0^\infty f(t) e^{-st} dt := F(s)$.

* useful for solving ODEs when the forcing term $f(t)$ is discontinuous.



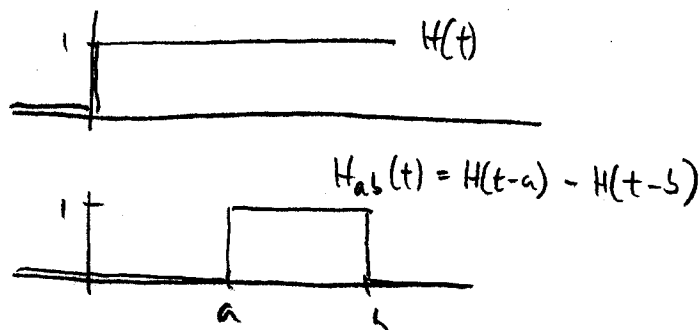
• $\mathcal{L}$ "turns derivatives into multiplication":

$$\mathcal{L}(y') = sY - y(0), \quad \mathcal{L}(y'') = s^2 Y - s y(0) - y'(0)$$

• Inverse Laplace transforms:

- * factor
- * partial fractions
- * complete the square, etc.

• Piecewise continuous functions can be written concisely using the Heaviside functions.



• Shifts in the t -domain correspond to multiplication by exponentials in the s -domain (and vice-versa).

$$* \mathcal{L}(e^{ct} f(t))(s) = F(s-c) \quad (-\infty < c < \infty)$$

$$* \mathcal{L}(f(t-c) H(t-c))(s) = e^{-cs} F(s) \quad (0 \leq c < \infty)$$