TWK2A
Additional properties of the Laplace transform (Section 7.4)
Problems

1. Solve the IVP
$$y' - y = te^t \sin t$$
with $y(0) = 0$.

2. Solve the IVP
$$y'' + 9y = \cos 3t$$
with $y(0) = 2, y'(0) = 5$.

3. Solve the IVP
$$y'' + y = \begin{cases} 1, & 0 \leqslant t < \frac{\pi}{2} \\ \sin t, & t \geqslant \frac{\pi}{2} \end{cases}$$
with $y(0) = 1, y'(0) = 0$.

4. Find
$$\mathcal{L}\left\{te^{2t} \sin 6t\right\}$$
using the concept of the derivative of a transform.

5. Let $f(t)$ be the meander function with extreme values -1 and 1. Furthermore, say $f(t)$ changes sign at integer multiples of some constant a. Determine the Laplace transform of $f(t)$.

6. Let $f(t)$ be the sawtooth function with extreme values 0 and a. Furthermore, say $f(t) = a$ at integer multiples of some constant b. Determine the Laplace transform of $f(t)$.