Written HW9 – MATH 2502 Spring 2021

Due by 9 March for timely completion credit

The Laplace transform of a function f is a function, named $\mathscr{L}\{f\}$, given by the following formula:

$$\mathscr{L}\{f\}(x) = \int_0^\infty e^{-xt} f(t)\mathrm{d}t.$$

1. Find the antiderivative $\displaystyle\int e^{-xt}\mathrm{d}t$. Be careful to note what the variable of integration is.
2. If $f(t) = 1$, then calculate $\mathscr{L}\{f\}(x)$. Your answer should have "x" in it.
3. If $g(t) = t$, then use integration by parts to calculate $\mathscr{L}\{g\}(x)$. Your answer should have "x" in it.
4. If $h(t) = t^2$, then use integration by parts twice to calculate $\mathscr{L}\{h\}(x)$.
5. Do you see a pattern? What do you think the Laplace transform of t^3 will be? What about the transform of t^n for $n = 4, 5, 6, \ldots$?