
MATH 213 - Tutorial 2: Computing Laplace Transforms

1. Compute the Laplace Transform of

$$f(t) = \begin{cases} 0 & t < 0 \\ 1 & 0 \leq t < 1 \\ 0 & 1 \leq t < 2 \\ 1 & 2 \leq t < 3 \\ e^{-(t-3)} & \text{else} \end{cases}$$

and find the ROC.

Hint: Be careful with the $s = 0$ case.

2. Suppose that we know that $\mathcal{L}\{f(t)\} = \frac{s^2}{(s+1)(s+2)}$ and $\mathcal{L}\{g(t)\} = \sin(s)$ where f and g are one-sided functions i.e. for $t < 0$, $f(t) = g(t) = 0$. Use the algebraic properties of the Laplace transform to compute

$$\mathcal{L}\{f(2(t-3)) - 2te^t g(t)\}.$$

3. Use the results from class (i.e. Laplace table) to compute

$$\mathcal{L}^{-1} \left\{ \frac{\omega s}{s^3 + s} \right\}.$$

4. Use the results from class (i.e. Laplace table) to compute

$$\mathcal{L}^{-1} \left\{ \frac{2 - s^2}{s^3 + 2s^2 + 2s} \right\}.$$

For extra practice for computing the forward transform see Paul's notes and for extra practice for computing inverse transforms also see Paul's notes. I **strongly** suggest doing the harder examples in Ex3 of the second link on your own before looking at the solutions. All questions of that level of difficulty are fair game for assignments or for harder exam questions.