Week 10: Laplace Transform

Welcome to the Weekly Review for MATH 2420. This week’s review talks about Laplace Transform. We would like to thank Patrick Bourque and the Spring 2015 MATH 2420 students for allowing us to film the Weekly Reviews.

The following problems are presented in the Week 10 videos. Thank you!

Part A: Laplace Transform

1. (a) Definition

(b) \( \mathcal{L}\{t\} = \)

(c) \( \mathcal{L}\{e^{at}\} = \)
2. Show $\mathcal{L}\{e^{t^2}\}$ does not exist.

3. Given $F(s) = \frac{4s^2-15s+41}{(s^2-4s+13)(s-2)}$, find $\mathcal{L}^{-1}\{F(s)\}$.
4. Given \( F(s) = \frac{2s^2 + 4s - 1}{s^2 - 4s + 4s} \), find \( \mathcal{L}^{-1}\{F(s)\} \).
5. Given \( F(s) = \sum_{n=1}^{\infty} \frac{1}{s^n} \), find \( \mathcal{L}^{-1}\{F(s)\} \).

6. Find the Laplace Transform of \( y' \).
7. Solve using Laplace Transform

\[ y' + y = e^t \quad y(0) = 1 \]

8. Solve using Laplace Transform

\[ y'' + 6y' + 5y = 12e^t \quad y(0) = -1 \text{ and } y'(0) = 7 \]
9. Solve using Laplace Transform

\[ y'' + 4y = \sin(2t) \quad y(0) = 10 \text{ and } y'(0) = 0 \]