

MATH 316 — REVIEW for Exam 3

Topic: Laplace Transform

Some sample problems are given to supplement hw problems

- Compute Laplace Transform using the definition.
 - §6.1. 11th ed: 3,6,8 , 10th ed 3,7,11
Using the definition, find $\mathcal{L}[t]$. Using this result, find $\mathcal{L}[t^2]$.
Using the definition, find $\mathcal{L}[y']$ (entry 14 in table). Using this result find $\mathcal{L}[y'']$ (entry 15 in table).
- Compute Laplace Transform and inverse Transform using the table. In the exam, you will be given the table posted on the course website.
 - §6.2. 11th ed: 1,2,3,6 10th ed: 1,2,3,8
 - §6.3. 11th ed: 5,9,10,13,14,15,16 10th ed: 7,13,15, 19,20,21,24
Find $\mathcal{L}^{-1}[F]$ where (a) $F(s) = \frac{1 + se^{-2s}}{s^2 - 4s + 13}$, (b) $F(s) = \frac{3s - 2}{s^2 + 2s + 5}$
- Solve ODEs using the Laplace Transforms, including step functions, delta functions, convolutions. Use alternative methods if applicable.
 - §6.2. 11th ed: 9,11,16 10th ed: 12, 15, 22
 - §6.4. 11th ed: 2,4,7 10th ed: 2,5,11 (can you sketch forcing function and solution in each case?)
Solve the following problem using two alternative methods:
$$y'' + y = g(t), y(0) = 0, y'(0) = 1, g(t) = \begin{cases} t/2, & 0 \leq t < 6 \\ 3, & t \geq 6 \end{cases}$$
 - §6.5. 11th ed: 1,6 10th ed: 1,8
Solve the following IVP: $y'' + \omega_o^2 y = \epsilon \cos \omega t$, $y(0) = y_0$, $y'(0) = y'_0$ where $\omega \neq \omega_o$ and $\epsilon > 0$.
- Graph step functions, compute convolution using definition, understand convergence issues of improper integrals.
 - §6.3. 11th ed: 1,3,4 10th ed: 1,4,6,
 - §6.6. 10th ed: 4,8,13,15. 11th ed: 4,7,11,12
can you give a 1-line argument to answer §6.1. 11th ed: 19-21, 10th ed: 25-28?