Review after Midterm Exam 2

Exam day: May 7. 1:30—3:30pm
Office hour: May 2, 11:30 am–1:15 pm

Eigenvalue problems

Exercise 1: Find all positive eigenvalues of

$$-y" = \lambda y, \quad y'(0) = y'(\pi) = 0.$$

Algebraic methods

Laplace transform: Definition and basic formulas for e^{at}, $\cos kt$, $\sin kt$, t^a, translation and partial fraction, integral, differentiation and convolution

Exercise 2: Find: $\mathcal{L}^{-1}\{F(s)\}$ if
(a). $F(s) = \frac{1}{s(s-3)}$;
(b). $F(s) = \frac{1}{s^2(s-3)}$;
(c). $F(s) = \frac{s-1}{(s+1)^3} + \frac{1}{s(s^2+1)}$.
(d). $F(s) = \frac{s}{(s^2+1)^2}$.

Using Laplace transform to solve initial value problem: D.E to A.E., solving A.E., then find $\mathcal{L}^{-1}\{F(s)\}$.

Exercise 3: Solve:
(a). $x'' + 4x = \sin 2t, \quad x(0) = x'(0) = 0.$
(b). $x' = 4x + 2y, y' = 3x - y; x(0) = 3, \ y(0) = -2;$
(c). $tx'' - 2x' + tx = 0, \ x(0) = 0.$
(d). $tx'' - 2x' + tx = 0, \ x(0) = 1.$
(f)* Can you find the general solution to $tx'' - 2x' + tx = 0$?