HW08

MATH 20D, LECTURE D00, FALL 2017

DUE MONDAY, NOV 11 NAME:

1. Find the first five nonzero terms in the solution of the given initial value problem.

$$y'' - xy' - y = 0, \quad y(0) = 11, y'(0) = 5.$$

2. Find the first five nonzero terms in the solution of the given initial value problem

$$y'' + xy' + 2y = 0, \quad y(0) = 8, y'(0) = 5.$$

3. Find the Laplace transform of $\cosh(bt)$, where b is a real constant. Recall that $\cosh(bt) = \frac{e^{bt}+e^{-bt}}{2}$ and $\sinh(bt) = \frac{e^{bt}-e^{-bt}}{2}$.

4. Find the Laplace transform of $\sinh(bt)$, where b is a real constant. Recall that $\cosh(bt) = \frac{e^{bt}+e^{-bt}}{2}$ and $\sinh(bt) = \frac{e^{bt}-e^{-bt}}{2}$.

5. Find the Laplace transform of $\cos(bt)$, where b is a real constant.

6. Use integration by parts, find the Laplace transform of the given function; a is a real constant.

$$f(t) = t^2 \sinh(at).$$

7. Find the inverse Laplace transform $\mathcal{L}^{-1}\{F(s)\}$ of the given function

$$F(s) = \frac{8}{s^2 + 4}.$$

8. Find the inverse Laplace transform $\mathcal{L}^{-1}\{F(s)\}$ of the given function

$$F(s) = \frac{5s + 15}{s^2 + 6s + 34}.$$

9. Find the inverse Laplace transform of

$$F(s) = \frac{9s - 5}{s^2 - 36}.$$

10. Find the inverse Laplace transform $\mathcal{L}^{-1}\{F(s)\}$ of the given function

$$F(s) = \frac{11s^2 - 15s + 54}{s(s^2 + 9)}.$$

11. Use the Laplace transform to solve the given initial value problem.

$$y'' - 2y' - 99y = 0, \quad y(0) = 6, y'(0) = 6.$$

12. Find the Laplace transform of the function

$$f(t) = \begin{cases} 0, & t < 4 \\ t^2 - 8t + 17, & t \geq 4 \end{cases}$$

13. Find the Laplace transform of the function

$$f(t) = \begin{cases} 0, & t < 3 \\ (t-3)^4, & t \geq 3 \end{cases}$$

14. Find the Laplace transform of the given function

$$f(t) = (t-8)u_4(t) - (t-4)u_8(t),$$

where $u_c(t)$ denotes the Heaviside function, which is 0 for $t < c$ and 1 for $t \geq c$.