

Differential Equations
Homework 11 (Optional)
Due 4/25 (Thurs) 11:59am

Note:

- Please show all of your work (writing a list of answers is not sufficient).
- Please indicate the people you worked with.
- **Please staple your HW.**
- Several random problems will be graded (1 point each).

1. Use the definition to find the Laplace transform of

(a)

$$f(t) = t$$

(b)

$$f(t) = e^{3t+1}$$

(c)

$$f(t) = \begin{cases} 1, & 0 < t \leq 1 \\ 0, & t > 1 \end{cases}$$

2. Use the table to find the Laplace transform of

(a)

$$f(t) = t - 2e^{3t}$$

(b)

$$f(t) = \sin(2t) + \cos(2t)$$

(c)

$$f(t) = \cos^2 2t$$

(Hint: Use double angle formula)

3. Use the table to find the inverse Laplace transform of

(a)

$$F(s) = \frac{3s + 1}{s^2 + 4}$$

(b)

$$F(s) = \frac{5 - 3s}{s^2 + 9}$$

(c)

$$F(s) = 2s^{-1}e^{-3s}$$

4. Use Laplace transforms to solve the initial value problem

(a)

$$x'' + 4x = 0; x(0) = 5, x'(0) = 0$$

(b)

$$x'' - x' - 2x = 0; x(0) = 0, x'(0) = 2$$

(c)

$$x'' + x = \cos(3t); x(0) = 1, x'(0) = 0$$

(d)

$$x'' + 3x' + 2x = t; x(0) = 0, x'(0) = 2$$