

Due 11/8/2024, 11:30 A.M.

Solve the following problems and staple your solutions to this cover sheet. (Computer outputs must be put in the appropriate place in the solution, not attached as an appendix. You may physically cut and paste the output in the problem or allow appropriate space in the printout to add your hand written work.)

1. Sec 7.2 #8

Hints: You may use  $\int e^{ax} \sin(bx) dx = \frac{1}{a^2+b^2} e^{ax} [a \sin(bx) - b \cos(bx)]$ . Show that the improper integral diverges for  $s \leq -1$ . Consider cases  $s > -1$ ,  $s = -1$  and  $s < -1$ .

2. Sec 7.2 #10

Hints:  $\mathcal{L}\{f(t)\} = \int_0^\infty e^{-st} f(t) dt = \int_0^1 e^{-st} f(t) dt + \int_1^\infty e^{-st} f(t) dt$ . Consider the case  $s = 0$  separately!

3. Sec 7.2 #21

4. Sec 7.2 #26

5. Sec 7.3 #1

6. Sec 7.3 #21

7. Sec 7.4 #3

8. Sec 7.4 #25

9. Sec 7.5 #4

10. Sec 7.5 #10

### Mathematica Commands

See your HW 2 for the Mathematica commands. Below are new commands that can be helpful for this homework.

A piecewise defined function can be inputted using the `Piecewise` command;

```
f[x_]:=Piecewise[{ {f1(x), a1 < x < b1}, {f2(x), a2 < x < b2}, ... } ]
```

is the function  $f(x) = \begin{cases} f_1(x), & a_1 < x < b_1 \\ f_2(x), & a_2 < x < b_2 \\ \vdots \end{cases}$ .