Math 2280 HOMEWORK #11 Name:

Due 4/3/2026, 9:30 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 7.8 #2
   Hint: For a continuous function f, $\int_{-\infty}^{\infty} f(t)\delta(t-a)\,dt = f(a)$
2. Sec 7.8 #5
   Hint: For $a > 0$, $\int_0^{\infty} f(t)\delta(t-a)\,dt = \int_{-\infty}^{\infty} f(t)\delta(t-a)\,dt$ since $\delta(t-a) = 0$ for $t < a < 0$.
3. Sec 7.8 #17
   Hint: You may use Mathematica to perform partial fraction decomposition.
4. Sec 7.8 #22
   Hint: You may graph the solution using Mathematica.
5. Sec 7.8 #29
   Hint: Solve the initial value problem and write the solution $x = x(t)$ as a step function. The problem is asking for position $x(t)$, relative to the equilibrium position, for $t > \pi/2$.
6. Sec 8.2 #1
   Note: Review of series from Calculus II. See the review handout. You can also watch `https://faculty.weber.edu/aghoreishi/Math2280_S26/Sec 8.1.mp4`.
7. Sec 8.2 #18
   Note: Review of series from Calculus II. See the review handout. You can also watch `https://faculty.weber.edu/aghoreishi/Math2280_S26/Sec 8.2.mp4`.
8. Sec 8.2 #32
   Note: Review of series from Calculus II. See the review handout. You can also watch `https://faculty.weber.edu/aghoreishi/Math2280_S26/Sec 8.2.mp4`.
9. Sec 8.3 #5
   Hint: $p(t) = \frac{1}{t-2}$ and $q(t) = -\frac{1}{t+1}$.
10. Sec 8.3 #15
    Hint: $(2a_2 - a_1 + a_0) + \sum_{n=1}^{\infty} \left[(n+2)(n+1)a_{n+2} + na_n - (n+1)a_{n+1} + a_n\right] x^n = 0$
11. Free points!
12. Free points!

Note: Mathematica commands are on the backside.

Mathematica Commands

See your HW 2 for the Mathematica commands. Below are some commands not in HW 2.

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

`f[x_]:=Piecewise[{ {`$f_1(x)$, $a_1 < x < b_1$`}, {`$f_2(x)$, $a_2 < x < b_2$`},` $\cdots$ `} ]`

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

The Mathematica notation for the unit step function $u(t-a)$ is `UnitStep[t-a]`.

The Mathematica notation for the Dirac delta function $\delta(t-a)$ is `DiracDelta[t-a]`.

The Mathematica notation for the Laplace transform is `LaplaceTransfrom[`$f(t)$`, t, s]` where $f(t)$ is the function and s is the independent variable of the Laplace transform $F(s)$.

The Mathematica notation for the inverse Laplace transform is `InverseLaplaceTransfrom[`$F(s)$`, s, t]` where $F(s)$ is the Laplace transform and t is the independent variable of the inverse $f(t)$.