Math 2280 HOMEWORK #11 Name:

Due 11/13/2026, 8:30 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 #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 $t > \pi/2$.

2. Sec 8.1 #8

3. 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_F26/Sec 8.1.mp4`.

4. 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_F26/Sec 8.2.mp4`.

5. 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_F26/Sec 8.2.mp4`.

6. Sec 8.3 #5
   Hint: $p(t) = \frac{1}{t-2}$ and $q(t) = -\frac{1}{t+1}$.

7. Sec 8.3 #15
   Hint: $(2a_2 - a_1 + a_0) + \sum_{n=1}^{\infty} \left[(n+2)(n+1)a_{n+2} + na_n - (n+1)a_{n+1} + a_n\right] x^n = 0$

8. Sec 8.3 #18
   Hint: $a_2 = \frac{1}{6}a_0$ and $a_{n+2} = \frac{2n}{3(n+2)}a_{n+1} - \frac{n-1}{3(n+2)(n+1)}a_n$. It turns out that $y = a_0 y_1 + a_1 y_2$ with $y_2 = x$.

9. Sec 8.3 #26

10. Free points!

11. Free points!

12. Free points!

Note: Mathematica command 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[{ {`$f_1(x)$`, `$a_1 < x < b_1$`}, {`$f_2(x)$`, `$a_2 < x < b_2$`}, ⋯ } ]`

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 $f(t)$.