Math 3710 HOMEWORK #7 Name:

Due 10/14/2022, 12:30, before start of the class.

Solve the following problems and staple your solutions to this cover sheet.

1. Sec 3.2 # 1(c, d)
   Note: Graph the Fourier series for $-3L < x < 3L$ (not just $-L \le x \le L$). Hint: Assume domain of f is $(-L, L)$ for some positive fixed length L.

2. Sec 3.2 # 2(a)
   Note: Graph the Fourier series for $-3L < x < 3L$ (not just $-L \le x \le L$). Hints: Assume domain of f is $(-L, L)$ for some positive fixed length L. For integration, do integration by parts, or use Review, Identities, Theorems, Formulas and Tables or Mathematica.

3. Sec 3.2 # 2(c)
   Note: Graph the Fourier series for $-3L < x < 3L$ (not just $-L \le x \le L$). Hints: Assume domain of f is $(-L, L)$ for some positive fixed length L. No integration is necessary!

4. Sec 3.2 #3
   Hint: Show that if $F(f)$, $F(g)$ and $F(h)$ are Fourier series of functions f, g and $h = c_1\, f + c_2\, g$, respectively, then $F(h) = c_1\, F(f) + c_2\, F(g)$.

5. Sec 3.3 #1(e)
   Note: Graph each Fourier series for $-3L < x < 3L$. Hint: Assume an appropriate domain for f; $(-L, L)$ or $(0, L)$, for some positive fixed length L.

6. Sec 3.3 #2(a)
   Note: Graph the Fourier sine series for $-3L < x < 3L$. Hints: The domain of f is $(0, L)$, for some positive fixed length L. For integration, you may use Review, Identities, Theorems, Formulas and Tables or Mathematica and must treat the case $n = 1$ separately.

7. Find the Fourier sine series of $f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2 \end{cases}$ and **discuss its convergence**.
   Hint: For integration, do integration by parts, or use Review, Identities, Theorems, Formulas and Tables or Mathematica.

8. Find and use the Fourier cosine series of $f(x) = x^2$, $0 < x < \pi$, to show that $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$.
   Hint: For integration, do integration by parts twice, or use Review, Identities, Theorems, Formulas and Tables or Mathematica. Apply the convergence theorem. Note: There are calculus based proofs of this result!

9. Free points!

10. Free points!