

Do any 7 of the following 10 exercises of your choice. Write up your solutions neatly in your own handwriting, and show all your work!

1. Do problem 6 on page 86 of Folland.
2. Do problem 1 on page 212 of Folland. **Justify your answers with estimates/integrals.**
3. Do problem 2 on page 213 of Folland.
4. Do problem 3 on page 213 of Folland. **Make sure to show your work.** For part (a), classify each of f , $f * f$, and $f * f * f$ as being either piecewise continuous, continuous, or continuously differentiable (i.e., having a continuous derivative). Would you expect $f * f * f * f$ to be more or less smooth than $f * f * f$? What's the pattern?
5. Do problem 4 on page 213 of Folland.
6. Do problem 5 on page 213 of Folland.
7. Consider the function $K : \mathbb{R} \rightarrow \mathbb{R}$ defined by equation (7.8) on page 212 of Folland. Prove that K and all of its derivatives, $K^{(l)} \forall l \in \mathbb{Z}^+$, are both continuous and bounded.

Hint: The only real difficulties will occur at $y = \pm 1$. You can handle them by showing that

$$\lim_{x \rightarrow \infty} \frac{p(x)}{e^x} = 0$$

holds for any polynomial $p(x)$ of finite degree, and then by arguing that this implies that $\lim_{y \rightarrow \pm 1} K^{(l)}(y) = 0$ holds for all $l \in \mathbb{Z}^+$.

8. Do problems 7 and 8 on page 213 of Folland. You should use the theorems stated in Section 7.1 of Folland for problem 8.
9. Do problem 3 on page 224 of Folland.
10. Derive entries 8 and 12 in Table 2 on page 223 of Folland.