1. Suppose $\sum |a_n|$ converges. By Carothers Exercise 10.26 we can define a function $f \in C(\mathbb{R})$ by $f(x) = \sum_{k=1}^{\infty} a_n \sin(nx)$.

a) Prove that $\int_0^{\pi} f(x)^2 \, dx = \frac{\pi}{2} \sum_{n=1}^{\infty} a_n^2$.

b) If there exist constants $M > 0$ and $\alpha > 2$ such that $|a_n| \leq \frac{M}{n^{\alpha}}$, prove that f is differentiable.

2. Carothers 8.33

3. Carothers 10.22

4. Carothers 10.23

5. Carothers 10.28

6. Carothers 10.32

7. Carothers 10.33

8. Carothers 11.12

9. Carothers 11.14