Math 116 Problem Set #5 Due Wed., Oct. 3, 2018, in class.

In Apostol, Volume I, read Chapter 4, Sections 13-17, pages 181-189; Chapter 5, Sections 1-4, pages 202-207; and Chapter 12, Sections 2-9, pages 446-458.

1. a) From Apostol, Volume I, Chapter 4, Section 4.9, pages 173-174, do problems 9, 15.
b) From Apostol, Volume I, Chapter 4, Section 4.15, pages 186-187, do problems 1, 4.
c) From Apostol, Volume I, Chapter 5, Section 5.5, pages 208-210, do problems 14, 16.

2. a) From Apostol, Volume I, Chapter 12, Section 12.4, pages 450-451, do problems 1(a,c), 5.

b) From Apostol, Volume I, Chapter 12, Section 12.8, pages 456-457, do problems 1(a,c,d), 3, 4.

3. Let $f(x) = 1$ if the integer $[x]$ is even, and let $f(x) = -1$ if $[x]$ is odd. Let $F(x) = \int_0^x f$ and let $\Phi(x) = \int_0^x F$. Graph the functions f, F, Φ. Are these functions integrable? continuous? differentiable?

4. a) Determine whether the function $f(x) = x^3 - x + 1$ has a maximum value and whether it has a minimum value on the closed interval $[-1, 2]$. If such values exist, find them and find for which values of x they are achieved. Relate your answer to the Extreme Value Theorem.

b) Redo part (a) on the open interval $(-1, 2)$.

5. Let f be the function defined in problem 5 of Problem Set 2, and extend f to a function on all of $\mathbb{R}$ by setting $f(x) = 0$ for x not in the interval $[0, 1]$.

a) At which real numbers x is the function $f(x)$ differentiable?
b) At which real numbers x is the function $xf(x)$ differentiable?
c) At which real numbers x is the function $x^2 f(x)$ differentiable?