1. Practice using summation notations: problems 29, 40, 41 (c, d, f, h) of Section 5.1 (page 344-345).

2. Use the identity \((k + 1)^2 - k^2 = 2k + 1\) to find an explicit formula for the sum \(\sum_{k=1}^{n} k\) in terms of \(n\).

3. Expand \((k + 1)^3 - k^3\) and use it to find an explicit formula for the sum \(\sum_{k=1}^{n} k^2\) in terms of \(n\).

4. To each of the functions below, do the following:
   
   (i) Graph the function on the given interval. You may need to use Mathematica.
   
   (ii) Divide the given interval into \(n\) equal subintervals \((n\) is a generic number\). Then write down the corresponding Riemann sum, using the summation notation.
   
   (iii) Use Mathematica to compute the Riemann sum you got with \(n = 5, n = 10, n = 100\).

   (a) \(\frac{1}{1+x^2}\) on the interval \([0, 2]\). Use left-point rule.
   
   (b) \(\ln x\) on the interval \([1, 4]\). Use right-point rule.
   
   (c) \(\sqrt{x+1}\) on the interval \([0, 3]\). Use midpoint rule.
   
   (d) \(\sin x\) on the interval \([0, \pi]\). Use trapezoid rule.

5. Consider function \(f(x) = x^2\) on the interval \([2, 3]\). Suppose we want to compute the area under \(f\).
   
   (i) Divide interval \([2, 3]\) into \(n\) equal subintervals. Then write the Riemann sum using left-point rule.
   
   (ii) Use the formula you obtain in Problem 3 to simplify this sum.
   
   (iii) Find the (exact) area under the graph of \(f\) and above the interval \([2, 3]\).

6. With the function \(f(x) = x^2\) as in Problem 5, we now want to compute the length of the graph of \(f\) over the interval \(x \in [2, 3]\).
   
   (i) Write a sum that approximates the length of the graph of \(f\).
   
   (ii) Find the approximate lengths for \(n = 5, n = 10, n = 30\).