

# Discussion Problems for Math 180

Tuesday, November 18, 2014

1. What is  $1 + 2 + 3 + 4 + \cdots + 5,000$ ?
2. Consider the function  $f(x) = 3x + 4$ .
  - (a) Sketch a graph of  $f(x)$  on the interval  $[-1, 1]$ .
  - (b) Write an expression for an  $n$ -rectangle left Riemann sum for  $f(x)$  on the interval  $[-1, 1]$ . Include a diagram showing what each piece of your expression represents.
  - (c) Write an expression for an  $n$ -rectangle *right* Riemann sum for  $f(x)$  on the interval  $[-1, 1]$ .
  - (d) Simplify the expression in part (b) to eliminate the  $\sum$ . (Hint: Look at problem 1.)
  - (e) Calculate the 1,000-rectangle right Riemann sum for  $f(x)$  on the interval  $[-1, 1]$ . Write your answer as a complete decimal expansion without using a calculator.
  - (f) Using the expression from part (d), find  $\int_{-1}^1 3x - 4 dx$  without using the fundamental theorem of calculus.
  - (g) Referring to your sketch from part (a), find  $\int_{-1}^1 3x - 4 dx$  without using any calculus at all, and check that it agrees with your answer to part (e).
  - (h) [Optional] Find  $\int_{-1}^1 3x - 4 dx$  using the fundamental theorem of calculus, and check that it agrees with your answer to part (e).

3. What is

$$\int_0^{2\pi} \sin(x) dx?$$

Justify your answer completely without making use of the fundamental theorem of calculus. (Hint: start by drawing a graph.)

4. Find a function  $z(t)$  such that  $z'(t) = 3 \cdot 2^t$  and  $z(1) = 0$ .