MATH 310 Spring 2017 **Homework #4** **Due Wednesday, February 8**

Please indicate how much time you spent on this assignment and give the name(s) of anyone you worked with.

1. Section 1.3 #3
2. Section 1.3 #14
3. Section 1.3 #16
4. Section 1.3 #23
5. Prove that for all $n \geq 1$,
$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}.$$
6. Use induction to prove that for all $n \geq 1$,
$$\frac{\mathrm{d}}{\mathrm{d}x}(x^n) = nx^{n-1}.$$
(Use the fact that $\frac{\mathrm{d}}{\mathrm{d}x}(x) = 1$ and the product rule $\frac{\mathrm{d}}{\mathrm{d}x}(fg) = f\frac{\mathrm{d}g}{\mathrm{d}x} + g\frac{\mathrm{d}f}{\mathrm{d}x}$.)

Challenge Problems

7. Section 1.3, Problem 34
8. Prove that for all $n \geq 2$,
$$\sqrt{n} < \frac{1}{\sqrt{1}} + \frac{1}{\sqrt{2}} + \cdots + \frac{1}{\sqrt{n}}.$$

Remember to write your solutions legibly on separate paper, include your instructor's name on the top of the first page and staple your assignment before handing it in.