# HW 18: Section 8.3

Due: Monday, November 18th in SQRC by 9pm

**Learning Goals:**

- Use the integral test to determine if a series converges or not
- Use the comparison test to determine if a series converges or not
- Develop critical thinking, problem solving, and creativity when working with series

## Questions:

1. Writing exercise 8.3.1 Notice that the comparison test doesn't always give us information about the convergence or divergence. If $a_k \leq b_k$ for each $k$ and $\sum_{k=1}^{\infty} b_k$ diverges, explain why you can't tell whether or not $\sum_{k=1}^{\infty} a_k$ diverges. Give some examples to support your reasoning.

2. Problem 8.3.6 Determine convergence or divergence of the series

   a) $\displaystyle\sum_{k=1}^{\infty} \frac{2k}{k^3+1}$

   b) $\displaystyle\sum_{k=1}^{\infty} \frac{k^2+1}{k^3+3k+2}$

3. Problem 8.3.6 Determine convergence or divergence of the series

   a) $\displaystyle\sum_{k=1}^{\infty} \frac{e^{-\sqrt{k}}}{\sqrt{k}}$

   b) $\displaystyle\sum_{k=1}^{\infty} \frac{ke^{-k^2}}{4+e^{-k}}$

4. Problem 8.3.6 Determine convergence or divergence of the series

   a) $\displaystyle\sum_{k=1}^{\infty} \frac{1}{\cos^2(k)}$

   b) $\displaystyle\sum_{k=1}^{\infty} \frac{e^{1/k}+1}{k^3}$

5. Choose one of the following two problems to turn in:

Problem 8.3.38 If $a_k > 0$ and $\sum_{k=1}^{\infty} a_k$ converges, show that $\sum_{k=1}^{\infty} a_k^2$ also converges. (hint: the comparison test might be useful)

Problem 8.3.42 Show that the every-other-term harmonic series $1 + \frac{1}{3} + \frac{1}{5} + \cdot$ diverges. (hint: you can write the series as $\sum_{k=1}^{\infty} \frac{1}{2k+1}$). What about the every-third-term harmonic series $1 + \frac{1}{4} + \frac{1}{7} + \cdots$?

6. Problem 8.3.50 in the book.