Math 226, Spring 2023 **Homework 2** Due at noon on Friday, 4/7

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(1) 10.1: 22, 60, 108, 126

(2) Determine whether each of the following series converges or diverges, and show that your answers are correct by citing (with full justification) the appropriate definitions or theorems.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{2n} - \sin^2(n)}$

(b) $1 + \dfrac{3}{4} + \dfrac{4}{6} + \dfrac{5}{8} + \dfrac{6}{10} + \dfrac{7}{12} + \cdots$ (Hint: first write this series in the form $\displaystyle\sum_{k=M}^{\infty} a_k$.)

(c) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n(\ln(n))^2}$

(3) Take the following as *fact*: a ball dropped from a height of H meters takes $\sqrt{H/5}$ seconds to hit the ground. (Likewise, a ball launched from the ground to a maximum height H takes $\sqrt{H/5}$ seconds to reach its peak.) Using this, determine the total time taken for the infinite process in Example 3 of 10.2.

Take that, Zeno!

(4) 10.2.104. Infinite perimeter and finite area: what a beautiful example!

(5) Determine all values of p for which the following series converges using the Integral Test. Make sure you justify why the integral test is applicable.

$$\sum_{n=3}^{\infty} \frac{1}{n\,(\ln(n))^{p+2}}$$

(6) Give a value of n for which $\sum_{k=1}^{n}(1/k^3)$ is within .001 of its exact value. Justify your claim.