1. Determine whether the following series converge or diverge. Make sure that you show your work. (Continued on the next page.)

(a) $\displaystyle\sum_{n=1}^{\infty} \sqrt[n]{5}$

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{n+2}{n^3+8}$

(b) $\displaystyle\sum_{n=3}^{\infty} \frac{9n^2-4}{e^n\left(n^2-4\right)}$

(e) $\displaystyle\sum_{n=1}^{\infty} \frac{3+2\cos(n)}{n^2}$

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2+5n+1}$

(f) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n\left(\ln(n)\right)^4}$

(g) $\displaystyle\sum_{n=7}^{\infty}\left(\frac{1}{n-6}-\frac{1}{n}\right)$

(i) $\displaystyle\sum_{n=3}^{\infty}\frac{(\ln(n))^2}{n}$

(h) $\displaystyle\sum_{n=1}^{\infty}\frac{n^3-n^2+1}{n^4+n^3}$

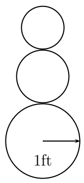
(j) $\displaystyle\sum_{n=1}^{\infty}\frac{5n^2-10n+12}{n^2}$

2. Find every real number k such that the following series converges.

$$\sum_{n=2}^{\infty} \frac{1}{n\left(\ln(n)\right)^k}$$

3. (#50 in Section 11.3 from Calculus the Classic Edition by Swokowski) Consider the hypothetical problem illustrated in the figure: Starting with a ball of radius 1 foot, a person stacks balls vertically such that if r_k is the radius of the k^{th} ball then $r_{n+1} = r_n\sqrt{n/(n+1)}$ for each positive integer n.

   (a) Show that the height of the stack can be made arbitrarily large.



   (b) If the balls are made of a material that weighs 1 lb/ft^3, show that the total weight of the stack is always less than 4π pounds.