1. (*10 points each*)

   Determine if the series is **absolutely convergent**, **conditionally convergent** or **divergent**. Be sure to show your reasoning. No work, no credit.

   (a) $\displaystyle\sum_{n=5}^{\infty} \frac{1}{\sqrt{n^3 + 10n}}$

   (b) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{6n + 3}$

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

2. (*10 points each*)

   Determine if the series is **absolutely convergent**, **conditionally convergent** or **divergent**. Be sure to show your reasoning. No work, no credit.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2}{6^n}$

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

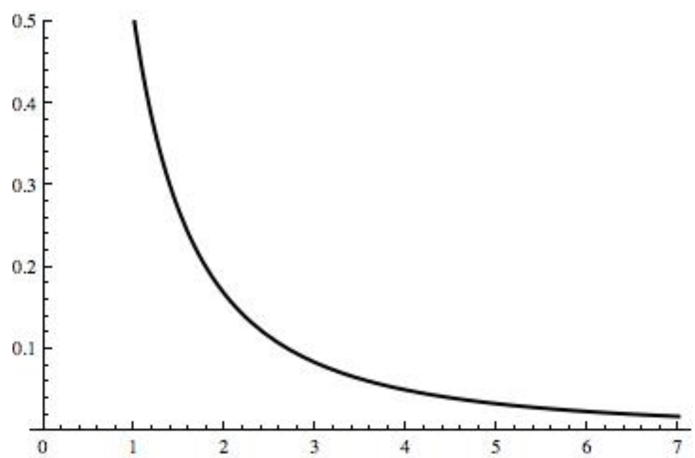
3. (*5 points*) Show that for any number $r \neq 1$ and positive integer k,

$$1 + r + r^2 + \cdots + r^k = \frac{1 - r^{k+1}}{1 - r}$$

4. (*5 points*) A series is defined by setting $a_0 = 4$ and $a_n = .5\, a_{n-1}$ for all $n > 0$. What is $\sum_{n=0}^{\infty} a_n$?

5. (*3 points*) Draw on the diagram and give a brief explanation why

$$\sum_{n=1}^{5} \frac{1}{n(n+1)} \geq \int_1^6 \frac{dx}{x(x+1)}$$



$$f(x) = \frac{1}{x(x+1)}$$

6. (*8 points, 2/3/3*)

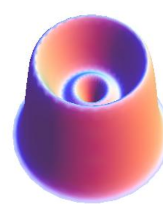
This problem concerns the curve

$$y = 5\sin x + \sin 5x, \qquad 0 \le x \le \pi$$

(a) Give an integral for the length of the curve. You do not need to evaluate the integral.

(b) Give an integral for the area of the surface obtained by rotating the curve about the x-axis. You do not need to evaluate the integral.

(c) Give an integral for the area of the surface obtained by rotating the curve about the y-axis. You do not need to evaluate the integral.



7. (*8 points*) Show that the following series diverges except for one value of c. Then compute the sum of the series for that value of c.

$$\sum_{n=2}^{\infty} \left(\frac{c}{n-1} + \frac{1}{n+1} \right)$$