# Written Homework

> Put your solutions inside the envelope on my office door (JMH 418) anytime before 12pm Friday 12/16. At that time, solutions will be posted to
> https://johnadamski.com

1. A right triangle ABC is given with $\angle A = \theta$ and $|\overline{AC}| = b$. The line segment $\overline{CD}$ is perpendicular to $\overline{AB}$, the line segment $\overline{DE}$ is perpendicular to $\overline{BC}$, and so on, as shown in the figure. Find the total length of all the perpendiculars

$$|\overline{CD}| + |\overline{DE}| + |\overline{EF}| + |\overline{FG}| + \ldots$$

in terms of b and θ. Hint: Use similar triangles and trigonometry to form a geometric series.
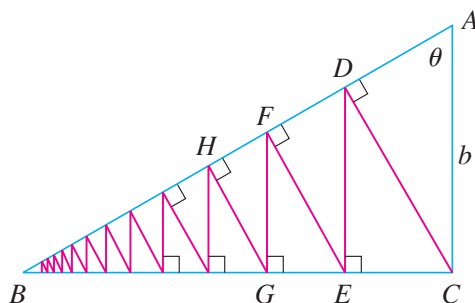
2. For each of the following series, determine if the series converges absolutely, converges conditionally, or diverges. Justify your answers.

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

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

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

   (d) $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{2^n n!}{5 \cdot 8 \cdot 11 \cdot \ldots \cdot (3n+2)}$

3. For each of the following power series, find the radius of convergence and the interval of convergence.

   (a) $\displaystyle\sum_{n=2}^{\infty} \frac{(x+2)^n}{2^n \ln n}$

   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{(2x-1)^n}{5^n \sqrt{n}}$

4. Suppose that the power series $\displaystyle\sum_{n=0}^{\infty} c_n x^n$ converges when $x = -4$ and diverges when $x = 6$. Then which of the following series must converge?

   (a) $\displaystyle\sum_{n=0}^{\infty} c_n$

   (b) $\displaystyle\sum_{n=0}^{\infty} c_n 8^n$

   (c) $\displaystyle\sum_{n=0}^{\infty} c_n (-3)^n$

   (d) $\displaystyle\sum_{n=0}^{\infty} (-1)^n c_n 9^n$