1. Suppose that $\sum_{k=0}^{\infty} a_k(x_0-a)^k$ diverges for some $x_0 \in \mathbb{R}$. Show that the power series diverges for all x such that $|x-a| > |x_0-a|$.

2. Suppose that for a power series $\sum_{k=0}^{\infty} a_k(x_0-a)^k$ has radius of convergence R. That is:

$$R = \sup\{|x-a| : \text{ the series converges for } x\}$$

   which is possible ∞.

   Show:

   (a) The series converges absolutely on $(a-R, a+R)$

   (b) The series diverges for all x for which $|x-a| > R$

3. For each of the following find the radius of convergence of the series.

   (a) $\sum_{k=1}^{\infty} k(x-2)^k$

   (b) $\sum_{k=0}^{\infty} k\left(-\frac{1}{3}\right)^k (x-2)^k$

   (c) $\sum_{k=0}^{\infty} \frac{k}{3^{2k-1}}(x-1)^{2k}$

   (d) $\sum_{k=2}^{\infty} \frac{x^k}{(\ln k)^k}$