$$\lim_{n\to\infty} \sqrt[n]{|a_n|} = \lim_{n\to\infty} \sqrt[n]{\left|\left(\frac{-2n}{n+1}\right)^{6n}\right|} = \lim_{n\to\infty} \frac{2^6 \, n^6}{(n+1)^6} = 64 \lim_{n\to\infty} \frac{1}{\left(\dfrac{n+1}{n}\right)^6}$$

$$= 64 \lim_{n\to\infty} \frac{1}{(1+1/n)^6} = 64(1) = 64 > 1,$$

so the series $\displaystyle\sum_{n=2}^{\infty} \left(\frac{-2n}{n+1}\right)^{6n}$ diverges by the Root Test.