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$$\sum_{k=0}^{\infty}\left[\left(\frac{2}{7}\right)^k (x+4)^{k+1}\right] = (x+4)+\left(\frac{2}{7}\right)(x+4)^2+\left(\frac{2}{7}\right)^2(x+4)^3+\cdots$$

is a geometric series with $r=\left(\frac{2}{7}\right)(x+4)$ and thus converges only if

$$-1 < \frac{2}{7}(x+4) < 1$$

$$-\frac{7}{2} < x+4 < \frac{7}{2}$$

$$-\frac{15}{2} < x < -\frac{1}{2}$$

So the series has an interval of convergence of $\left(-\frac{15}{2}, -\frac{1}{2}\right)$ and a radius of convergence of $R=\frac{7}{2}$.