n	$f^{(n)}(x)$	$f^{(n)}(5\pi)$
0	$2\cos x$	-2
1	$-2\sin x$	0
2	$-2\cos x$	2
3	$2\sin x$	0
4	$2\cos x$	-2
$\vdots$	$\vdots$	$\vdots$

$$
\begin{aligned}
f(x) &= 2\cos x = \sum_{k=0}^{\infty} \frac{f^{(k)}(5\pi)}{k!}(x-5\pi)^k \\
&= -2 + 2\frac{(x-5\pi)^2}{2!} - 2\frac{(x-5\pi)^4}{4!} + 2\frac{(x-5\pi)^6}{6!} - \cdots \\
&= 2\sum_{n=0}^{\infty} (-1)^{n+1}\frac{(x-5\pi)^{2n}}{(2n)!} \\
\lim_{n\to\infty}\left|\frac{a_{n+1}}{a_n}\right| &= \lim_{n\to\infty}\left[\frac{2\left|x-5\pi\right|^{2n+2}}{(2n+2)!}\cdot\frac{(2n)!}{2\left|x-5\pi\right|^{2n}}\right] \\
&= \lim_{n\to\infty}\frac{\left|x-5\pi\right|^2}{(2n+2)(2n+1)} = 0 < 1 \text{ for all } x, \text{ so } R=\infty.
\end{aligned}
$$