Problem Set #33

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Problem 5

(k)
$$\begin{aligned}
&\lim_{x\to 0}\frac{1-\cos 4x}{x^2}\\
=&\lim_{x\to 0}\left(\frac{1}{x^2}\cdot\left(1-\left(1-\frac{(4x)^2}{2!}+\frac{(4x)^4}{4!}-\frac{(4x)^6}{6!}+...\right)\right)\right)\\
=&\lim_{x\to 0}\left(\frac{1}{x^2}\cdot\left(\frac{16x^2}{2!}-\frac{256x^4}{4!}+\frac{4096x^6}{6!}-...\right)\right)\\
=&\lim_{x\to 0}\left(\frac{16}{2!}-\frac{256x^2}{4!}+\frac{4096x^4}{6!}-...\right)\\
=&\frac{16}{2!}\\
=&\boxed{8}
\end{aligned}$$