Q $f(x) = (\ln(x))^2$

(a) $\lim_{x\to\infty} \frac{f(x)}{x} = \lim_{x\to\infty} \frac{(\ln x)^2}{x}$ $\left(\frac{\infty}{\infty}\right)$ form, use l'hospital rule

$= \frac{2\ln x \cdot \frac{1}{x}}{1} \Rightarrow \frac{2}{x} = \boxed{0}$ exist

(b) $\lim_{x\to\infty} f'(x) = \lim_{x\to\infty} \frac{2\ln x}{x} = \boxed{0} \neq 2$ ✗

(c) $\lim_{x\to\infty} [\ln(x+1)]^2 - (\ln x)^2 =$

$\lim_{x\to\infty} = [(\ln 2)^2 - (\ln 1)^2] + [(\ln 3)^2 - (\ln 2)^2] + [(\ln 4)^2 - (\ln 3)^2] + \cdots$

$[(\ln x+1)^2 - (\ln x)^2]$

$\lim_{x\to\infty} 0 + (\ln(x+1))^2 = \boxed{\infty}$ does not exist

option (b) is correct