$(x_n > 4)$ limit | $(y_n < 4)$

$\Rightarrow \lim_{n\to\infty} e^{-(25\cdot\frac{1}{n} + 10\cdot\frac{1}{n}\cdot\frac{1}{n} + \frac{1}{n}\cdot\frac{1}{n}\cdot\frac{1}{n})}$

$\Rightarrow e^{-(25\cdot 0 + 10\cdot 0\cdot 0 + 0\cdot 0\cdot 0)}$

$\Rightarrow e^{-0}$

$\Rightarrow 1$

$\Rightarrow \lim_{n\to\infty} \sqrt{|-25\cdot\frac{1}{n} + 10\cdot\frac{1}{n}\cdot\frac{1}{n} - \frac{1}{n}\cdot\frac{1}{n}\cdot\frac{1}{n}|}$

$\Rightarrow \sqrt{|-25\cdot 0 + 10\cdot 0\cdot 0 - 0\cdot 0\cdot 0|}$

$\Rightarrow \sqrt{|0|}$

$\Rightarrow 0$

- Since $x_n, y_n \to 4$ and $x_n, y_n \neq 4$ and since $\lim_{n\to\infty} h(x_n) = 1$, $\lim_{n\to\infty} h(x_n) = 0$ and $1 \neq 0$, this must mean that $h(x)$ is undefined at 4 as the $\lim_{x\to 4} h(x) = \text{DNE}$

if $x > 4$; | if $x < 4$

$h(x) = e^{-(x-4)(x+1)^2}$

$= e^{-z}$ (for some $z \in \mathbb{R}$)

$h(x) = \sqrt{|(x-4)(x+1)^2|}$

$= \sqrt{|z|}$ (for some $z \in \mathbb{R}$)

- Since $e^{-z}$ is continuous for any $z$, $h(x)$ is continuous if $x > 4$

- Since $\sqrt{|z|}$ is continuous for any $z$, $h(x)$ is continuous if $x < 4$

* Note $g(x) = z$ as $g(x)$ is a polynomial that will always give a real number for a given $x$ (from limit of polynomials)

$\therefore$ $h(x)$ is continuous on the interval $(-\infty, 4) \cap (4, \infty)$, with an essential discontinuity at $[4]$