3.) a) $\lim\limits_{n \to \infty} (\sqrt{n+2} - \sqrt{n})$

$= \lim\limits_{n \to \infty} \dfrac{(\sqrt{n+2} - \sqrt{n})(\sqrt{n+2} + \sqrt{n})}{\sqrt{n+2} + \sqrt{n}}$

$= \lim\limits_{n \to \infty} \dfrac{n+2-n}{\sqrt{n+2} + \sqrt{n}} = \lim\limits_{n \to \infty} \dfrac{2}{\sqrt{n+2} + \sqrt{n}}$

$= \underline{\underline{0}}$

b) $\lim\limits_{n \to \infty} \dfrac{1}{\sqrt{n+\sqrt{n}} - \sqrt{n}} = \lim\limits_{n \to \infty} \dfrac{\sqrt{n+\sqrt{n}} + \sqrt{n}}{(\sqrt{n+\sqrt{n}} + \sqrt{n})(\sqrt{n+\sqrt{n}} - \sqrt{n})}$

$= \lim\limits_{n \to \infty} \dfrac{\sqrt{n+\sqrt{n}} + \sqrt{n}}{n+\sqrt{n} - n} = \lim\limits_{n \to \infty} \dfrac{\sqrt{n+\sqrt{n}} + \sqrt{n}}{\sqrt{n}}$

$= \lim\limits_{n \to \infty} \dfrac{\frac{\sqrt{n+\sqrt{n}} + \sqrt{n}}{\sqrt{n}}}{\frac{\sqrt{n}}{\sqrt{n}}} = \lim\limits_{n \to \infty} \dfrac{\sqrt{\frac{n+\sqrt{n}}{n}} + 1}{1}$

$= \lim\limits_{n \to \infty} \left(\sqrt{1 + \frac{1}{\sqrt{n}}} + 1 \right) = \qquad 1+1 = \underline{\underline{2}}$

$\frac{1}{\sqrt{n}} \downarrow 0$

$\downarrow 1$