1. $\lim\limits_{x \to 0} \dfrac{x}{\sqrt[3]{x+8} - 2} = \dfrac{0}{2-2} = \dfrac{0}{0}$

let $u = \sqrt[3]{x+8}$ $\quad x = u^3 - 8 \quad$ as $x \to 0,\ u \to 2$

$\lim\limits_{u \to 2} \dfrac{u^3 - 8}{u - 2} = \dfrac{0}{0} \to \lim\limits_{u \to 2} \dfrac{(u-2)(u^2+2u+4)}{(u-2)}$

$= \lim\limits_{u \to 2} u^2 + 2u + 4 = 2^2 + 2(2) + 4 = \boxed{12}$

2. $\lim\limits_{x \to 0} \dfrac{2x^2}{\sqrt[3]{(x+27)^2} - 6\sqrt[3]{x+27} + 9} = \dfrac{0}{0}$ $\quad$ let $u = \sqrt[3]{x+27}$ $\quad x = u^3 - 27$

$x \to 0,\ u \to 3$

$\lim\limits_{u \to 3} \dfrac{2(u^3-27)^2}{u^2 - 6u + 9} = \lim\limits_{u \to 3} \dfrac{2(u-3)^2(u^2+3u+9)^2}{(u-3)^2}$

$= \lim\limits_{u \to 3} 2(u^2+3u+9)^2 = 2(3^2 + 3(3) + 9)^2 = 2(27^2) = \boxed{1458}$

3. $\lim\limits_{b \to 5} \dfrac{b^2 - 25}{10 + 3b - b^2} = \dfrac{25-25}{10+15-25} = \dfrac{0}{0}$ $\quad \lim\limits_{b \to 5} \dfrac{(b+5)(b-5)}{-(b-5)(b+2)}$

$= \lim\limits_{b \to 5} \dfrac{b+5}{-(b+2)} = \dfrac{5+5}{-(5+2)} = \boxed{-\dfrac{10}{7}}$

4. $\lim\limits_{x \to -2} \dfrac{x+2}{\frac{1}{x} + \frac{1}{2}} = \dfrac{-2+2}{-\frac{1}{2} + \frac{1}{2}} = \dfrac{0}{0}$ $\quad \lim\limits_{x \to -2} \dfrac{x+2}{\frac{2}{2x} + \frac{x}{2x}}$

$= \lim\limits_{x \to -2} \left(\dfrac{x+2}{1}\right)\left(\dfrac{2x}{x+2}\right) = \lim\limits_{x \to -2} 2x = 2(-2) = \boxed{-4}$

5. $\lim\limits_{n\to 2} \dfrac{\frac{1}{n^2+1} - \frac{1}{5}}{n-2} = \frac{0}{0} = \lim\limits_{n\to 2} \dfrac{\frac{5}{5(n^2+1)} - \frac{(n^2+1)}{5(n^2+1)}}{\frac{n-2}{1}}$

$= \lim\limits_{n\to 2} \dfrac{5-n^2-1}{5(n^2+1)(n-2)} = \lim\limits_{n\to 2} \dfrac{4-n^2}{5(n^2+1)(n-2)} = \lim\limits_{n\to 2} \dfrac{(2-n)(2+n)}{-5(n^2+1)(2-n)}$

$= \lim\limits_{n\to 2} \dfrac{2+n}{-5(n^2+1)} = \dfrac{2+2}{-5(2^2+1)} = \boxed{-\dfrac{4}{25}}$

6. $\lim\limits_{z\to 4} \dfrac{z^2-16}{\sqrt{z}-2} = \frac{0}{0} \quad \lim\limits_{z\to 4} \dfrac{(z+4)(z-4)}{\sqrt{z}-2}$

$= \lim\limits_{z\to 4} \dfrac{(z+4)(\sqrt{z}+2)(\sqrt{z}-2)}{\sqrt{z}-2} = \lim\limits_{z\to 4} (z+4)(\sqrt{z}+2)$

$= (4+4)(\sqrt{4}+2) = \boxed{32}$

7. $\lim\limits_{x\to 25} \dfrac{\sqrt{x}-5}{x-25} = \frac{0}{0} \quad \lim\limits_{x\to 25} \dfrac{\sqrt{x}-5}{(\sqrt{x}+5)(\sqrt{x}-5)}$

$= \lim\limits_{x\to 25} \dfrac{1}{\sqrt{x}+5} = \dfrac{1}{\sqrt{25}+5} = \boxed{\dfrac{1}{10}}$

8. $\lim\limits_{x\to 3} \dfrac{(x^2-9)}{(3x-9)(x+1)} = \frac{0}{0} \quad \lim\limits_{x\to 3} \dfrac{(x+3)(x-3)}{3(x-3)(x+1)}$

$= \lim\limits_{x\to 3} \dfrac{x+3}{3(x+1)} = \dfrac{3+3}{3(3+1)} = \dfrac{6}{12} = \boxed{\dfrac{1}{2}}$

9. $\lim\limits_{x \to -1} \dfrac{x^3+1}{x^2+6x+5} = \dfrac{0}{0}$ $\lim\limits_{x \to -1} \dfrac{(x+1)(x^2-x+1)}{(x+1)(x+5)}$

$= \lim\limits_{x \to -1} \dfrac{x^2-x+1}{x+5} = \dfrac{(-1)^2-(-1)+1}{-1+5} = \boxed{\dfrac{3}{4}}$

10. $\lim\limits_{x \to 5} \dfrac{\sqrt[3]{(x+3)^2} - 2\sqrt[3]{x+3}}{\sqrt[3]{(x+3)^2} - 6\sqrt[3]{x+3} + 8} = \dfrac{0}{0}$

$u = \sqrt[3]{x+3}$ $x = u^3 - 3$ $x \to 5,\ u \to 2$

$\lim\limits_{u \to 2} \dfrac{u^2-2u}{u^2-6u+8} = \dfrac{0}{0}$ $\lim\limits_{u \to 2} \dfrac{u(u-2)}{(u-4)(u-2)}$

$= \lim\limits_{u \to 2} \dfrac{u}{u-4} = \dfrac{2}{2-4} = \boxed{-1}$