1) $\lim\limits_{x \to 3/2} \dfrac{6x^2+7x-3}{2x^2+11x+12}$

$$= \frac{6\left(\frac{3}{2}\right)^2+7\left(\frac{3}{2}\right)-3}{2\left(\frac{3}{2}\right)^2+11\left(\frac{3}{2}\right)+12}$$

$$= \frac{\cancel{6}^{3}\left(\frac{9}{\cancel{4}_{2}}\right)+\frac{21}{2}-3}{\cancel{2}\left(\frac{9}{\cancel{4}_{2}}\right)+\frac{33}{2}+12}$$

$$= \frac{\frac{27}{2}+\frac{21}{2}-3}{\frac{9}{2}+\frac{33}{2}+12}$$

$$= \frac{24-3}{21+12} = \frac{21}{33} = \frac{7}{11}$$

2) $\lim \dfrac{x^3-3x^2+4}{x^3-7x^2+16x-12}$ $\rightarrow$

$$x=2 \quad \begin{array}{|cccc}
1 & -3 & 0 & 4 \\
 & 2 & -2 & -4 \\
\hline
1 & -1 & -2 & \vert\, 0
\end{array}$$

$$x=2 \quad \begin{array}{|cccc}
1 & -7 & 16 & -12 \\
 & 2 & -10 & 12 \\
\hline
1 & -5 & 6 & \vert\, 0
\end{array}$$

$$\lim \frac{\cancel{(x-2)}(x^2-x-2)}{\cancel{(x-2)}(x^2-5x+6)} = \frac{(x-2)(x+1)}{(x-3)(x-2)} = \frac{x+1}{x-3}$$

$$\lim_{x \to 2} \frac{x+1}{x-3} = \frac{2+1}{2-3} = \frac{3}{-1} = -3$$

3) $\lim\limits_{x \to 2} \dfrac{3x-6}{(1-\sqrt{4x-7})} \cdot \dfrac{(1+\sqrt{4x-7})}{1+\sqrt{4x-7}}$

$\lim\limits_{x \to 2} \dfrac{3x-6)\ (1+\sqrt{4x-7}}{1-4x+7}$

$= \dfrac{3\cancel{(x-2)} \cdot (1+\sqrt{4x-7}}{-4\cancel{(x-2)}}$

$\lim\limits_{x \to 2} \dfrac{3\ (1+\sqrt{4x-7}}{4}$

$= \dfrac{3\ (1+\sqrt{1})}{4} = \dfrac{3(2)}{\cancel{4}_{2}}$

$= \dfrac{3}{2}$

4) $\lim\limits_{x \to 4} \dfrac{3-\sqrt{5+x}}{1-\sqrt{5-x}} \cdot \dfrac{(1+\sqrt{5-x})}{(1+\sqrt{5-x}} = \dfrac{(3-\sqrt{5+x}\ (1+\sqrt{5-x})(3+\sqrt{5+x})}{(1-5+x) \cdot (3+\sqrt{5+x}}$

$\lim\limits_{x \to 4} \dfrac{(9-5-x)\ (1+\sqrt{5-x})\ (3+\sqrt{5+x})}{(x-4)\ (3+\sqrt{5+x})}$

$\lim\limits_{x \to 4} \dfrac{-\cancel{(x-4)}\ (1+\sqrt{5-x})\ (3+\sqrt{5-x})}{\cancel{(x-4)}\ (3+\sqrt{5+x}}$

$= \dfrac{(1+1)\ (3+3)}{3+3}$

$= \dfrac{2 \times \cancel{6}}{\cancel{6}} = 2$

(5) $f(g(x)) = 2g^2(x) - 3$

$= 2(x+1+a)^2 - 3$

$\lim_{\to 0} \quad 2(x+1+a)^2 - 3 = 5$

$2(0+1+a)^2 - 3 = 5$

$2(a+1)^2 = 8$

$(a+1)^2 = 4 \quad \Rightarrow \quad a+1 = \pm\sqrt{4}$

$a+1 = \pm 2$

$a+1 = 2 \qquad\qquad a+1 = -2$

$\boxed{a = 1} \qquad\qquad \boxed{a = -3}$

(6) VoF

(F) $\lim_{x \to 0} \frac{x}{x}$ no existe

$= \begin{cases} \lim \frac{x}{x} = \lim_{x \to} 1 = 1 \\ \lim_{x \to 0^-} \frac{-x}{x} = \lim_{x \to 0} -1 = -1 \end{cases} \neq$

(F) $\lim_{x \to 3} \frac{x^3+3}{x+3} = 27$

$= \frac{(3)^3+3}{3+3} = \frac{27+3}{6} = \frac{30}{6} = 5$

(V) $\lim_{x \to 1} \frac{x^2-3x+2}{x^2-4x+3} = \frac{1}{2}$

$= \lim_{x \to 1} \frac{(x-2)\cancel{(x-1)}}{(x-3)\cancel{(x-1)}} = \frac{1-2}{1-3} = \frac{1}{2} = \frac{1}{2}$

7) $f(x) \begin{cases} 3x^2+2x, & x \leq 1 \\ \sqrt{x-1}+5; & x > 1 \end{cases}$

$$\lim_{x \to 1^+} F(x) = \lim_{x \to 1} \sqrt{x-1}+5$$

$$= \sqrt{1-1}+5 = 5$$

$$\lim_{x \to 1^-} f(x) = \lim_{x} 3x^2+2x$$

$$= 3(1)^2+2(1) = 5$$

$$\therefore \lim_{x \to 1} f(x) = 5$$

8) $$A = \lim_{x \to 8} \frac{\sqrt[3]{x^2} - 4\sqrt[3]{x} + 4}{(x-8)^2}$$

$$= \lim_{x \to 8} \frac{(x^{1/3})^2 - 4(x^{1/3}) + 4}{(x-8)^2}$$

$$= \lim_{x \to 8} \frac{(x^{1/3}-2)^2}{(x-8)^2} = \lim_{x \to 8} \left(\frac{x^{1/3}-2}{x-8}\right)^2$$

$$= \lim_{x \to 8} \left(\frac{\cancel{x-8}}{x^{2/3}+2x^{1/3}+4}\right)^2 \left(\frac{1}{\cancel{x-8}}\right)^2$$

$$= \left[\frac{1}{8^{2/3}+2(8)^{1/3}+4}\right] = \frac{1}{4+4+4}$$

$$= \frac{1}{12}$$

9) $L = \lim_{x \to 2} \frac{\sqrt[3]{14+x^3} - \sqrt{x^2+5}}{x-2}$

$= \lim_{x \to 2} \frac{(14x^3)^{1/3} - (x^2+5)^{1/2}}{x-2}$

$= \lim_{x \to 2} \frac{\frac{1}{3}(14+x^3)^{-2/3}(3x^2) - \frac{1}{2}(x^2+5)^{-1/2} 2x}{1}$

$= \frac{1}{3}(14+8)^{-2/3}(3)(4) - \frac{1}{2}(4+5) \cdot 2(2)$

$= \frac{1}{3}(22)^{-2/3} 12 - 2(9)^{-1/2}$

$= \frac{4}{22^{2/3}} - \frac{2}{\sqrt{9}} = \frac{4}{\sqrt[3]{22^2}} - \frac{2}{3}$

$= \frac{4}{\sqrt[3]{484}} - \frac{2}{3}$

10) $\lim_{x \to 2} \left(\frac{12}{8-x^3} - \frac{1}{2-x} \right)$

$= \lim_{x \to 2} \frac{12}{(2-x)(4+2x+x^2)} - \frac{1}{(2-x)}$

$= \lim_{x \to 2} \frac{8-2x-x^2}{4+2x+x^2}$

$= \frac{8-4-4}{4+4+4} = \frac{0}{12} = 0$

(11) $P(x) = 2x^3 - 5x^2 - 2x - 3$

	2	-5	-2	-3
3	↓	6	3	3
	2	1	1	$\boxed{0}$

$P(x) = (x-3)(2x^2+x+1)$

$Q(x) = 4x^3 - 13x^2 + 4x - 3$

	4	-13	4	-3
3	↓	12	-3	3
	4	-1	1	0

$Q(x) = (x-3)(4x^2 - 1x + 1)$

$$\lim_{x\to 3} \frac{P(x)}{Q(x)} = \lim_{x\to 3} \frac{\cancel{(x-3)}(2x^2+x+1)}{\cancel{(x-3)}(4x^2-1x+1)}$$

$$= \frac{2(9)+3+1}{4(9)-3+1} = \frac{18+4}{36-2} = \frac{22}{34} = \frac{11}{17}$$

(12) $$\lim_{x\to a} \frac{x^2 - a^2}{2x^2 - ax - a}$$

$$= \lim_{x\to a} \frac{(x-a)(x+a)}{(2x+a)(x-a)}$$

$$= \frac{a+a}{2a+a} = \frac{2a}{3a} = \frac{2}{3}$$