1. **(a)**

$$\lim_{x\to a}[f(x)+h(x)] = \lim_{x\to a} f(x)+\lim_{x\to a} h(x) = -3+8=5$$

(b) $\lim_{x\to a}[f(x)]^2=\left[\lim_{x\to a} f(x)\right]^2=(-3)^2=9$

(c) $\lim_{x\to a}\sqrt[3]{h(x)}=\sqrt[3]{\lim_{x\to a} h(x)}=\sqrt[3]{8}=2$

(d) $\lim_{x\to a}\frac{1}{f(x)}=\frac{1}{\lim_{x\to a} f(x)}=\frac{1}{-3}=-\frac{1}{3}$

(e) $\lim_{x\to a}\frac{f(x)}{h(x)}=\frac{\lim_{x\to a} f(x)}{\lim_{x\to a} h(x)}=\frac{-3}{8}=-\frac{3}{8}$

(f) $\lim_{x\to a}\frac{g(x)}{f(x)}=\frac{\lim_{x\to a} g(x)}{\lim_{x\to a} f(x)}=\frac{0}{-3}=0$

(g) The limit does not exist, since $\lim_{x\to a} g(x)=0$ but $\lim_{x\to a} f(x)\neq 0$.

(h) $\lim_{x\to a}\frac{2f(x)}{h(x)-f(x)}=\frac{2\lim_{x\to a} f(x)}{\lim_{x\to a} h(x)-\lim_{x\to a} f(x)}=\frac{2(-3)}{8-(-3)}=-\frac{6}{11}$

2. **(a)** $\lim_{x\to 2}[f(x)+g(x)]=\lim_{x\to 2} f(x)+\lim_{x\to 2} g(x)=2+0=2$

(b) $\lim_{x\to 1} g(x)$ does not exist since its left– and right–hand limits are not equal, so the given limit does not exist.

(c) $\lim_{x\to 0}[f(x)g(x)]=\lim_{x\to 0} f(x)\cdot\lim_{x\to 0} g(x)=0\cdot 1.3=0$

(d) Since $\lim_{x\to -1} g(x)=0$ and g is in the denominator, but $\lim_{x\to -1} f(x)=-1\neq 0$, the given limit does not exist.

(e) $\lim_{x\to 2} x^3 f(x)=\left[\lim_{x\to 2} x^3\right]\left[\lim_{x\to 2} f(x)\right]=2^3\cdot 2=16$

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

5.

$$\lim_{x\to 3}(x^2-4)(x^3+5x-1)=\lim_{x\to 3}(x^2-4)\cdot\lim_{x\to 3}(x^3+5x-1)$$ [Limit Law 4]

$$=\left(\lim_{x\to 3}x^2-\lim_{x\to 3}4\right)\cdot\left(\lim_{x\to 3}x^3+5\lim_{x\to 3}x-\lim_{x\to 3}1\right)$$ [2, 1 and 3]

$$=(3^2-4)\cdot(3^3+5\cdot 3-1)$$ [7, 8 and 9]

$$=5\cdot 41=205$$

11. $\lim_{x\to 2}\frac{x^2+x-6}{x-2}=\lim_{x\to 2}\frac{(x+3)(x-2)}{x-2}=\lim_{x\to 2}(x+3)=2+3=5$

15. $\lim_{t\to -3}\frac{t^2-9}{2t^2+7t+3}=\lim_{t\to -3}\frac{(t+3)(t-3)}{(2t+1)(t+3)}=\lim_{t\to -3}\frac{t-3}{2t+1}=\frac{-3-3}{2(-3)+1}=\frac{-6}{-5}=\frac{6}{5}$

17. $\lim_{h\to 0}\frac{(4+h)^2-16}{h}=\lim_{h\to 0}\frac{(16+8h+h^2)-16}{h}=\lim_{h\to 0}\frac{8h+h^2}{h}=\lim_{h\to 0}\frac{h(8+h)}{h}=\lim_{h\to 0}(8+h)=8+0=8$

21. $\lim_{t\to 9}\frac{9-t}{3-\sqrt{t}}=\lim_{t\to 9}\frac{\left(3+\sqrt{t}\right)\left(3-\sqrt{t}\right)}{3-\sqrt{t}}=\lim_{t\to 9}\left(3+\sqrt{t}\right)=3+\sqrt{9}=6$

23.

$$\lim_{x\to 7}\frac{\sqrt{x+2}-3}{x-7}=\lim_{x\to 7}\frac{\sqrt{x+2}-3}{x-7}\cdot\frac{\sqrt{x+2}+3}{\sqrt{x+2}+3}=\lim_{x\to 7}\frac{(x+2)-9}{(x-7)\left(\sqrt{x+2}+3\right)}$$

$$=\lim_{x\to 7}\frac{x-7}{(x-7)\left(\sqrt{x+2}+3\right)}=\lim_{x\to 7}\frac{1}{\sqrt{x+2}+3}=\frac{1}{\sqrt{9}+3}=\frac{1}{6}$$

29.

$$\lim_{t\to 0}\left(\frac{1}{t\sqrt{1+t}}-\frac{1}{t}\right)=\lim_{t\to 0}\frac{1-\sqrt{1+t}}{t\sqrt{1+t}}=\lim_{t\to 0}\frac{\left(1-\sqrt{1+t}\right)\left(1+\sqrt{1+t}\right)}{t\sqrt{t+1}\left(1+\sqrt{1+t}\right)}=\lim_{t\to 0}\frac{-t}{t\sqrt{1+t}\left(1+\sqrt{1+t}\right)}$$

$$=\lim_{t\to 0}\frac{-1}{\sqrt{1+t}\left(1+\sqrt{1+t}\right)}=\frac{-1}{\sqrt{1+0}\left(1+\sqrt{1+0}\right)}=-\frac{1}{2}$$

35. $1 \le f(x) \le x^2+2x+2$ for all x. Now $\lim_{x\to -1} 1=1$ and
$\lim_{x\to -1}(x^2+2x+2)=\lim_{x\to -1} x^2+2\lim_{x\to -1} x+\lim_{x\to -1} 2=(-1)^2+2(-1)+2=1$. Therefore, by the Squeeze Theorem,
$\lim_{x\to -1} f(x)=1$.

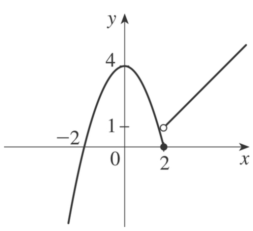
46. **(a)**

$$\lim_{x\to 2^-} f(x) =\lim_{x\to 2^-}\left(4-x^2\right)=\lim_{x\to 2^-} 4-\lim_{x\to 2^-} x^2$$
$$=4-4=0$$

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

(b) No, $\lim_{x\to 2} f(x)$ does not exist since $\lim_{x\to 2^-} f(x)\ne\lim_{x\to 2^+} f(x)$.

(c)



56. Let $f(x)=[x]$ and $g(x)=-[x]$. Then $\lim_{x\to 3} f(x)$ and $\lim_{x\to 3} g(x)$ do not exist (Example 10) but
$\lim_{x\to 3}\left[f(x)+g(x)\right]=\lim_{x\to 3}([x]-[x])=\lim_{x\to 3} 0=0$.