

5.2 1)

$$\alpha) \quad \lim_{x \rightarrow x_0} [2f(x) - 1] = \lim_{x \rightarrow x_0} 2f(x) - \lim_{x \rightarrow x_0} 1 = 2 \lim_{x \rightarrow x_0} f(x) - 1 \stackrel{\lim_{x \rightarrow x_0} f(x)=2}{=} 2 \cdot 2 - 1 = \boxed{3}$$

$$\begin{aligned} \beta) \quad \lim_{x \rightarrow x_0} \frac{4f(x)}{f^2(x) - 2} &= \frac{\lim_{x \rightarrow x_0} [4f(x)]}{\lim_{x \rightarrow x_0} [f^2(x) - 2]} = \frac{\lim_{x \rightarrow x_0} 4 \cdot \lim_{x \rightarrow x_0} [f(x)]}{\lim_{x \rightarrow x_0} f^2(x) - \lim_{x \rightarrow x_0} 2} = \\ &= \frac{\lim_{x \rightarrow x_0} 4 \cdot \lim_{x \rightarrow x_0} [f(x)]}{\left[\lim_{x \rightarrow x_0} f(x) \right]^2 - \lim_{x \rightarrow x_0} 2} \stackrel{\lim_{x \rightarrow x_0} f(x)=2}{=} \frac{4 \cdot 2}{2^2 - 2} = \boxed{4} \end{aligned}$$

5.2 2)

$$\begin{aligned} \lim_{x \rightarrow x_0} [(f(x) - 1)(f(x) + 2)] &= \lim_{x \rightarrow x_0} (f(x) - 1) \cdot \lim_{x \rightarrow x_0} (f(x) + 2) = \\ &= \left| \left(\lim_{x \rightarrow x_0} f(x) - \lim_{x \rightarrow x_0} 1 \right) \cdot \left(\lim_{x \rightarrow x_0} f(x) + \lim_{x \rightarrow x_0} 2 \right) \right| \stackrel{\lim_{x \rightarrow x_0} f(x)=2}{=} (2 - 1)(2 + 2) = \boxed{4} \end{aligned}$$

5.2 3)

$$\begin{aligned} \lim_{x \rightarrow x_0} \lim_{x \rightarrow x_0} \sqrt{5f(x) - 1} &= \sqrt{\lim_{x \rightarrow x_0} [5f(x) - 1]} = \sqrt{\lim_{x \rightarrow x_0} [5f(x)] - \lim_{x \rightarrow x_0} 1} = \\ &= \sqrt{5 \lim_{x \rightarrow x_0} f(x) - 1} \stackrel{\lim_{x \rightarrow x_0} f(x)=2}{=} \sqrt{5 \cdot 2 - 1} = \boxed{3} \end{aligned}$$

5.2 4)

$$\begin{aligned} \lim_{x \rightarrow x_0} \frac{|5 - f^3(x)|}{2f(x) - 1} &= \frac{\left| \lim_{x \rightarrow x_0} [5 - f^3(x)] \right|}{\lim_{x \rightarrow x_0} [2f(x) - 1]} = \frac{\left| \lim_{x \rightarrow x_0} 5 - \lim_{x \rightarrow x_0} f^3(x) \right|}{\lim_{x \rightarrow x_0} 2f(x) - \lim_{x \rightarrow x_0} 1} = \\ &= \frac{\left| 5 - \left[\lim_{x \rightarrow x_0} f(x) \right]^3 \right|}{2 \lim_{x \rightarrow x_0} f(x) - 1} \stackrel{\lim_{x \rightarrow x_0} f(x)=2}{=} \frac{|5 - 2^3|}{2 \cdot 2 - 1} = \frac{|-3|}{3} = \frac{3}{3} = 1 \end{aligned}$$