1. **Exercise 1.**

   (a) \( h(x) = (x^4 - 1) \sin x \). The function \( h(x) \) is continuous on \((-\infty, \infty)\) since it is the product of two functions that are continuous on \((-\infty, \infty)\), namely the polynomial \( y = x^4 - 1 \) and the function \( y = \sin x \).

   (b) \( h(x) = \frac{x^3}{e^x} \). The function \( h(x) \) is continuous on \((-\infty, \infty)\), since it is the quotient of two functions that are continuous on \((-\infty, \infty)\), namely the polynomial \( y = x^3 \) and the function \( y = e^x \), and since \( e^x \) is never equal to 0.

   (c) \( h(x) = \frac{\cos x}{e^x - 4} \). Note that both \( y = \cos x \) and \( y = e^x - 4 \) are continuous on \((-\infty, \infty)\). So their quotient is continuous everywhere except where \( e^x - 4 = 0 \). So \( h(x) \) is continuous everywhere except at \( x = \ln 4 \).

2. **Exercise 2.**

   (a) \[ \lim_{x \to \sqrt{e}} (5 + \ln x) = 5 + \ln \sqrt{e} = 5 + \frac{1}{2} = 5.5 \]

   (b) \[ \lim_{x \to \frac{\pi}{4}} (3 \sin x) = 3 \cdot \sin \frac{\pi}{4} = 3 \cdot \frac{1}{\sqrt{2}} = \frac{3}{\sqrt{2}} \]

   (c) \[ \lim_{x \to \ln 3} xe^x = \ln 3 \cdot e^{\ln 3} = (\ln 3)(3) = 3 \ln 3, \text{ which can also be written as } \ln 27. \]

   (d) \[ \lim_{x \to -1} \frac{2^x}{x^4 + 4} = \frac{2^{-1}}{(-1)^4 + 4} = \frac{1}{10} \]

3. **Exercise 3.**

   (a) \[ \lim_{x \to 0} e^{\sin x + 3} = e^{\lim_{x \to 0} (\sin x + 3)} = e^{\sin 0 + 3} = e^{0 + 3} = e^3 \]

   (b) \[ \lim_{x \to 2} \ln \left( \frac{x^3 e^x}{x + 6} \right) = \ln \left( \lim_{x \to 2} \frac{x^3 e^x}{x + 6} \right) = \ln \left( \frac{2^3 e^2}{2 + 6} \right) = \ln \left( \frac{8e^2}{8} \right) = \ln(e^2) = 2 \]