Calculating Basic Limits: Examples

1. Given that
$$\lim_{x\to 3} f(x) = -1 \qquad \lim_{x\to 3} g(x) = 0 \qquad \lim_{x\to 3} h(x) = 2,$$
determine if the following limits exist. If so, evaluate:

   (a) $\lim_{x\to 3}[2f(x) + 3h(x)]$

   (b) $\lim_{x\to 3} f(x)[h(x)]^2$

   (c) $\lim_{x\to 3} \dfrac{g(x)}{f(x)}$

   (d) $\lim_{x\to 3} \dfrac{f(x)}{g(x)}$

2. Suppose you know that $\lim_{x\to 0} g(x) = 1$. Knowing this limit, find $\lim_{x\to 0} \dfrac{2g(x) + x^2}{4\cos x}$

3. Evaluate $\lim_{x\to 4} \dfrac{16 - x^2}{x - 4}$

4. Evaluate $\lim_{x\to 2} \sqrt{\dfrac{2x+1}{x^2-1}}$

5. Evaluate $\lim_{x\to -2} \dfrac{x^2 + 6x + 8}{x^2 - 4}$

6. Evaluate $\lim_{x\to 2} \dfrac{\sqrt{x-1} - 1}{x - 2}$

7. Evaluate $\lim_{x\to 1} \dfrac{x - 1}{\sqrt{x+3} - 2}$

8. Evaluate $\lim_{x\to 0^+} x^2 \sin\left(\dfrac{1}{2}\ln|x|\right)$

9. Find $\lim_{x\to 2} \dfrac{(x-2)\sin x}{|x|^3}$

10. Evaluate $\lim_{x\to 0} \left(x^4 \sin\left(\dfrac{5}{x}\right)\right)$