Exercise 2

The graphs of f and g are given. Use them to evaluate each limit, if it exists. If the limit does not exist, explain why.

(a) $\lim\limits_{x\to 2}\,[f(x)+g(x)]$

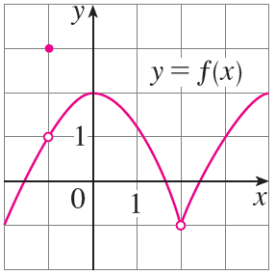
(b) $\lim\limits_{x\to 0}\,[f(x)-g(x)]$

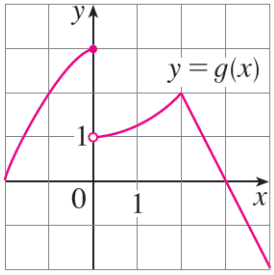
(c) $\lim\limits_{x\to -1}\,[f(x)g(x)]$

(d) $\lim\limits_{x\to 3}\,\dfrac{f(x)}{g(x)}$

(e) $\lim\limits_{x\to 2}\,\left[x^2 f(x)\right]$

(f) $f(-1)+\lim\limits_{x\to -1}\,g(x)$





Solution

$$\lim_{x\to 2}\,[f(x)+g(x)] = \lim_{x\to 2} f(x) + \lim_{x\to 2} g(x) = -1+2 = 1$$

$\lim\limits_{x\to 0}\,[f(x)-g(x)]$ does not exist because $\lim\limits_{x\to 0^-} g(x) \neq \lim\limits_{x\to 0^+} g(x)$.

$$\lim_{x\to -1}\,[f(x)g(x)] = \left[\lim_{x\to -1} f(x)\right]\left[\lim_{x\to -1} g(x)\right] = (1)(2) = 2$$

$\lim\limits_{x\to 3}\,\dfrac{f(x)}{g(x)}$ does not exist because $\lim\limits_{x\to 3} g(x) = 0$.

$$\lim_{x\to 2}\,\left[x^2 f(x)\right] = \left(\lim_{x\to 2} x^2\right)\left[\lim_{x\to 2} f(x)\right] = (4)(-1) = -4$$

$$f(-1)+\lim_{x\to -1}\,g(x) = 3+2 = 5$$