1. For the function g whose graph is given, state the value of the given quantity, if it exists.

(a) $\lim\limits_{x\to -2^-} g(x)$

(b) $\lim\limits_{x\to -2^+} g(x)$

(c) $\lim\limits_{x\to -2} g(x)$

(d) $g(-2)$

(e) $\lim\limits_{x\to 0} g(x)$

(f) $g(0)$

(g) $\lim\limits_{x\to 2^-} g(x)$

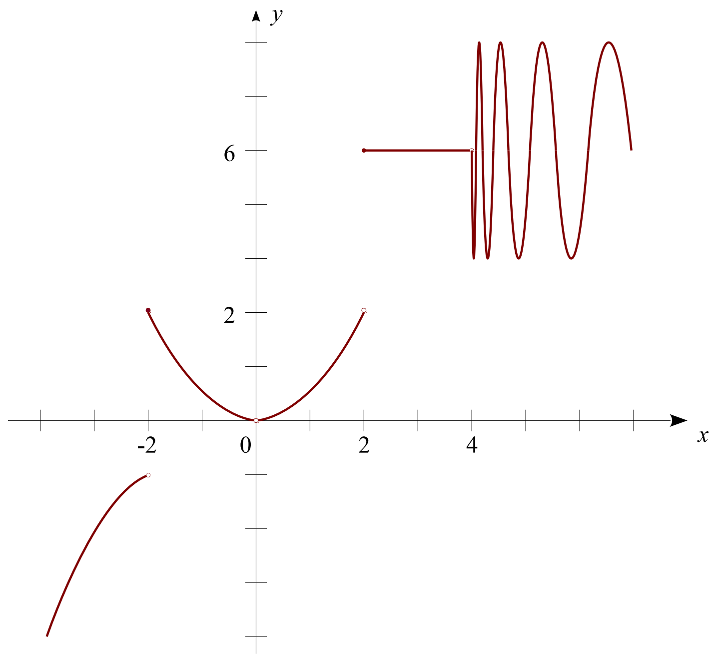
(h) $\lim\limits_{x\to 2^+} g(x)$

(i) $g(2)$

(j) $\lim\limits_{x\to 4^-} g(x)$

(k) $\lim\limits_{x\to 4^+} g(x)$

(l) $\lim\limits_{x\to 4} g(x)$



2. Find all holes and vertical asymptote(s) for the graph of

$$g(x) = \frac{(x^2+5x)(x-2)}{(x+1)(x^2+4x-5)}$$

and determine the behavior of the function near the vertical asymptotes.

3. Calculate the following limits or state why the limit does not exist. Do not use the L'Hospital's Rule.

(a) $\lim\limits_{x\to 4} \sqrt{x+\sqrt{x}}$

(b) $\lim\limits_{x\to 5} \dfrac{5x-x^2}{x^2-4x-5}$

(c) $\lim\limits_{h\to 0} \dfrac{(3+h)^{-1}-3^{-1}}{h}$

(d) $\lim\limits_{x\to 3} \dfrac{x-\sqrt{4x-3}}{x^2-9}$

(e) $\lim\limits_{x\to 0} \left(\dfrac{1}{x}-\dfrac{1}{|x|}\right)$

(f) $\lim\limits_{x\to 2} \dfrac{x^2+x-6}{|x-2|}$

(g) $\lim\limits_{t\to 5} \left\langle \dfrac{2t-10}{t-5}, \dfrac{5-t}{t^2-4t-5} \right\rangle$

(h) $\lim\limits_{x\to 0} x^4 \cos\dfrac{1}{x^2}$

4. If $2x - 2 \leq f(x) \leq x^2 - 2x + 2$ for $x \geq 0$, find $\lim_{x \to 2} f(x)$.

5. Let

$$f(x) = \begin{cases} \sqrt{-x}, & \text{if } x < 0 \\ 3 - x, & \text{if } 0 \leq x < 3 \\ (x-3)^2, & \text{if } x > 3 \end{cases}$$

Evaluate each limit if exists.

(a) $\lim_{x \to 0} f(x)$

(b) $\lim_{x \to 3} f(x)$

6. Find the x-value at which f is discontinuous and determine whether f is continuous from the right, or from the left, or neither.

$$f(x) = \begin{cases} 1 + x^2, & \text{if } x \leq 0 \\ 4 - x, & \text{if } 0 < x \leq 4 \\ (x-4)^2, & \text{if } x > 4 \end{cases}$$

7. Find the value(s) of x where the function $f(x)$ is discontinuous. If the discontinuity, $x = a$, is removable, find a function g that agrees with f for all values of x and is continuous at $x = a$.

(a) $f(x) = \dfrac{x - 4}{x^2 + x - 20}$

(b) $f(x) = \dfrac{x^2 - 2x - 8}{x^2 - x - 6}$

8. Find the values of a and b that make f continuous everywhere.

$$f(x) = \begin{cases} \dfrac{x^2 - 4}{x - 2}, & \text{if } x < 2 \\ ax^2 - bx + 3, & \text{if } 2 \leq x < 3 \\ 4xa + b, & \text{if } x \geq 3 \end{cases}$$

9. Use the Intermediate Value Theorem to show that there is a root of the equation $x^4 + x = 3$ in the interval $(1, 2)$.