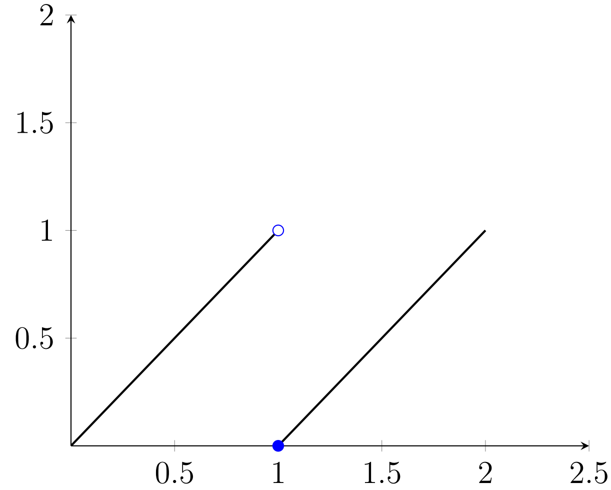
1. Use the graph of f in the figure below to find the following values or state that they do not exist. If a limit does not exist, explain why.



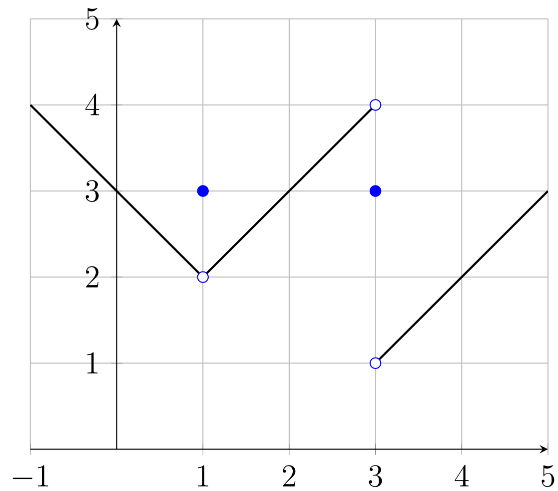
   1. $f(1)$;
   2. $\lim_{x\to 1^-} f(x)$;
   3. $\lim_{x\to 1^+} f(x)$;
   4. $\lim_{x\to 1} f(x)$;

2. Sketch the graph of a function with the given properties. You do not need to find a formula for the function.

$$g(1) = 0, \quad g(2) = 1, \quad g(3) = -2, \quad \lim_{x\to 2} g(x) = 0,$$
$$\lim_{x\to 3^-} g(x) = -1, \quad \lim_{x\to 3^+} g(x) = -2.$$

3. Use the graph of f in the figure to find the following values or state that they do not exist. If a limit does not exist, explain why.

a. $f(1)$	b. $\lim_{x\to 1^-} f(x)$	c. $\lim_{x\to 1^+} f(x)$
d. $\lim_{x\to 1} f(x)$	e. $f(3)$	f. $\lim_{x\to 3^-} f(x)$
g. $\lim_{x\to 3^+} f(x)$	h. $\lim_{x\to 3} f(x)$	i. $f(2)$
j. $\lim_{x\to 2^-} f(x)$	k. $\lim_{x\to 2^+} f(x)$	l. $\lim_{x\to 2} f(x)$



4. Evaluate $\lim_{b \to 2} \dfrac{3b}{\sqrt{4b+1} - 1}$.

5. Show that $\lim_{x \to 0} |x| = 0$ by first evaluating $\lim_{x \to 0^-} |x| = 0$ and $\lim_{x \to 0^+} |x| = 0$. Recall that

$$|x| = \begin{cases} x & \text{if } x \geq 0, \\ -x & \text{if } x < 0. \end{cases}$$

6. Evaluate the limits

   - $\lim_{x \to 3} \dfrac{x^2 - 2x - 3}{x - 3}$,
   - $\lim_{x \to 4} \dfrac{x^2 - 16}{4 - x}$, and
   - $\lim_{h \to 0} \dfrac{\frac{1}{5+h} - \frac{1}{5}}{h}$.

7. An extremely popular commodity called the NewFad is produced by a company called Useless, Inc.; after millions of dollars spent in market research, Useless, Inc. has determined a model of the NewFad's sales, as follows:

   When the price of the NewFad is \$400, the weekly demand for it in a particular district is 8000 units. For every \$2 increase in price, the weekly demand decreases by 40 units.

   Assume that the *fixed costs* of production on a weekly basis are \$250,000, and that the *variable costs* of production are \$75 per unit.

   (a) Find the (linear) demand equation for the NewFad; use the notation p for the unit price and q for the weekly demand.

   (b) Find the weekly cost function $C = C(q)$ for producing q NewFads per week. (*Hint: $C(q)$ will also be a linear function.*)

   (c) Find the weekly revenue function $R = R(q)$. (*Hint: $R(q)$ will be a quadratic function.*)

   (d) The *break-even* points are where *cost* equals *revenue*, i.e., when $C(q) = R(q)$. Find the break-even points for the NewFad.

(e) On the same set of axes, sketch graphs of $C(q)$ and $R(q)$, and use these graphs to help you explain why there are two break-even points.

(f) *Profit* is defined to be revenue minus cost; that is, $P(q) = R(q) - C(q)$. Find the profit function $P(q)$ for this situation. (*Hint: the profit function will be a quadratic function.*)

(g) Graph $P(q)$ on the same axes as in part (e). On this graph, indicate the regions of *profit* and *loss* (respectively, where $P(q) > 0$ and where $P(q) < 0$.)

(h) How should Useless, Inc. operate in order to maximize the weekly profit $P(q)$? Be sure to include a mathematical argument in your explanation.