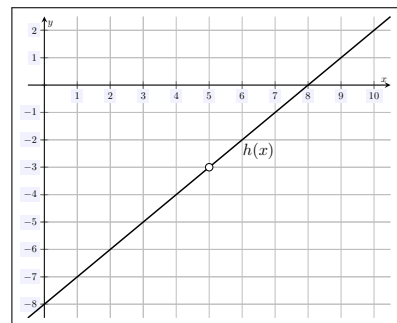
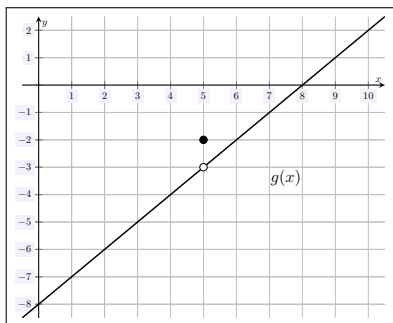
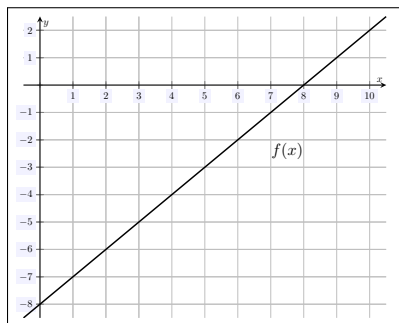


Check-In 08/22. (True/False) If $\lim_{x \rightarrow 5} f(x) = -3$, then $f(5) = -3$.

Solution. The statement is *false*. A function's limit (if it even exists) *does not* have to be the same as the function's value at that limiting value—the function does not even have to be defined there! Consider the three examples below.



For the graph of $f(x)$ on the left, $\lim_{x \rightarrow 5} f(x) = -3$, so they are equal. However, observe that for $g(x)$ (the middle graph), we have $\lim_{x \rightarrow 5} g(x) = -3$ but $g(5) = -2$, so that $\lim_{x \rightarrow 5} g(x) \neq g(5)$. Similarly, in the graph of $h(x)$ on the right, $\lim_{x \rightarrow 5} h(x) = -3$ but $h(-3)$ is not defined, so that $\lim_{x \rightarrow 5} h(x) \neq h(-3)$. A function's value (if even defined) need not be related to its limit (if the limit even exists).