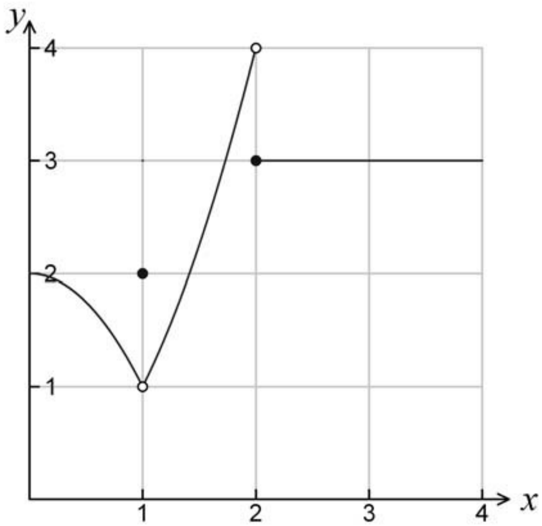
1. The function f and its graph are shown below:

$$f(x)=\begin{cases} -x^2+2 & 0\le x<1 \\ 2 & x=1 \\ x^2 & 1<x<2 \\ 3 & x\ge 2 \end{cases}$$



(a) Calculate $\lim_{x\to 2^-} f(x)$

(b) Which value is greater $\lim_{x\to 1} f(x)$ or $f(1)$? Justify your conclusion.

(c) At what value(s) of c on the interval $[0,4]$ does $\lim_{x\to c} f(x)$ not exist? Justify your conclusion.

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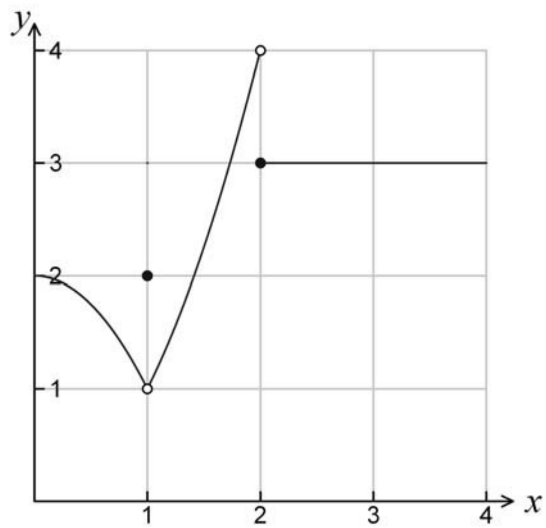
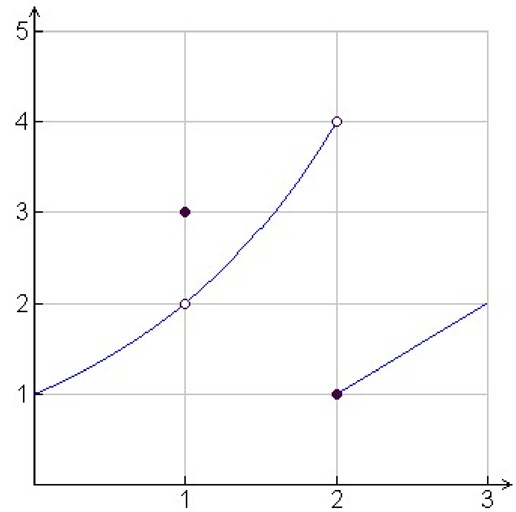


(a) Calculate $\lim_{x\to 2^-} f(x)$ As we approach $x=2$ from the left, the graph of $f(x)$ nears 4 so $\lim_{x\to 2^-} f(x)=4$.	+1 $\lim_{x\to 2^-} f(x)=4$
(b) Which value is greater $\lim_{x\to 1} f(x)$ or $f(1)$? Justify your conclusion. Since $\lim_{x\to 1^-} f(x)=1$ and $\lim_{x\to 1^+} f(x)=1$, $\lim_{x\to 1} f(x)=1$. From the function equation and graph, we see $f(1)=2$. Therefore, $f(1)>\lim_{x\to 1} f(x)$.	+1 $\lim_{x\to 1} f(x)=1$ +1 $f(1)=2$ +2 $f(1)>\lim_{x\to 1} f(x)$
(c) At what value(s) of c on the interval $[0,4]$ does $\lim_{x\to c} f(x)$ not exist? Justify your conclusion. If the function f is continuous at $x=c$, then $\lim_{x\to c} f(x)$ exists and $\lim_{x\to c} f(x)=f(c)$. We find the discontinuities in the graph of $f(x)$. Discontinuities occur at $x=1$ and $x=2$. Consider $\lim_{x\to 1} f(x)$ and $\lim_{x\to 2} f(x)$. In part (b), we showed $\lim_{x\to 1} f(x)=1$ so the limit exists at $x=1$. Consider $\lim_{x\to 2} f(x)$. $\lim_{x\to 2^-} f(x)=4$ and $\lim_{x\to 2^+} f(x)=3$. Since the left and right hand limits are not equal, $\lim_{x\to 2} f(x)$ does not exist.	+1 If f is continuous at $x=c$, then $\lim_{x\to c} f(x)$ exists. +1 $\lim_{x\to 1} f(x)=1$ +1 $\lim_{x\to 2^-} f(x)=4$ and $\lim_{x\to 2^+} f(x)=3$ +1 At $x=2$, $\lim_{x\to c} f(x)$ does not exist.

1. The function f and its graph are shown below:

$$f(x)=\begin{cases} 2^x & 0\le x<1 \\ 3 & x=1 \\ 2^x & 1<x<2 \\ x-1 & 2\le x \end{cases}$$



(a) Calculate $\lim_{x\to 2^+} f(x)$

(b) Which value is greater $\lim_{x\to 1} f(x)$ or $f(2)$? Justify your conclusion.

(c) At what value(s) of c on the interval $[0,3]$ does $\lim_{x\to c} f(x)$ not exist? Justify your conclusion.