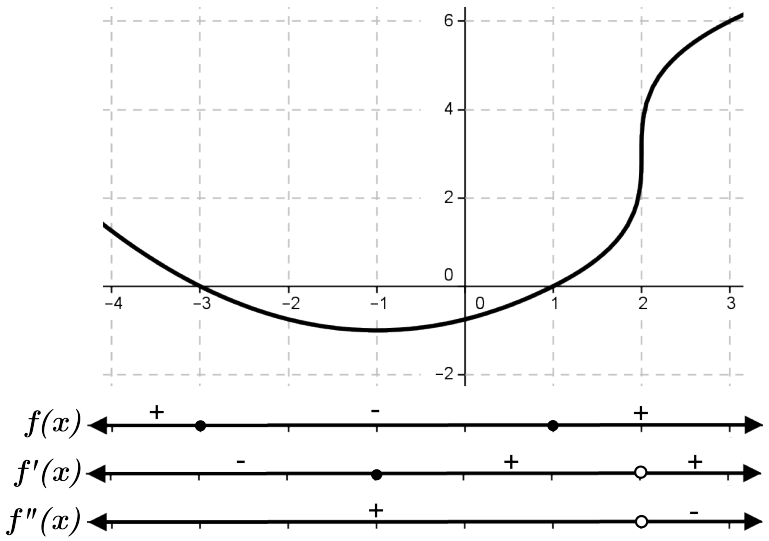
1. In the graph of $f(x)$ below, number lines are used to mark where $f(x)$ is zero/positive/negative/undefined, where $f'(x)$ is zero/positive/negative/undefined, and where $f''(x)$ is zero/positive/negative/undefined. Closed circles on the number lines indicate a zero-value, and open-circles indicate an undefined value.



(a) What do the closed circles on the number line for $f(x)$ correspond to on the graph of $f(x)$?

(b) How does each + or − sign on the number line for $f(x)$ relate to the graph?

(c) What does the closed circle at $x = -1$ on the number line for $f'(x)$ correspond to on the graph of $f(x)$?

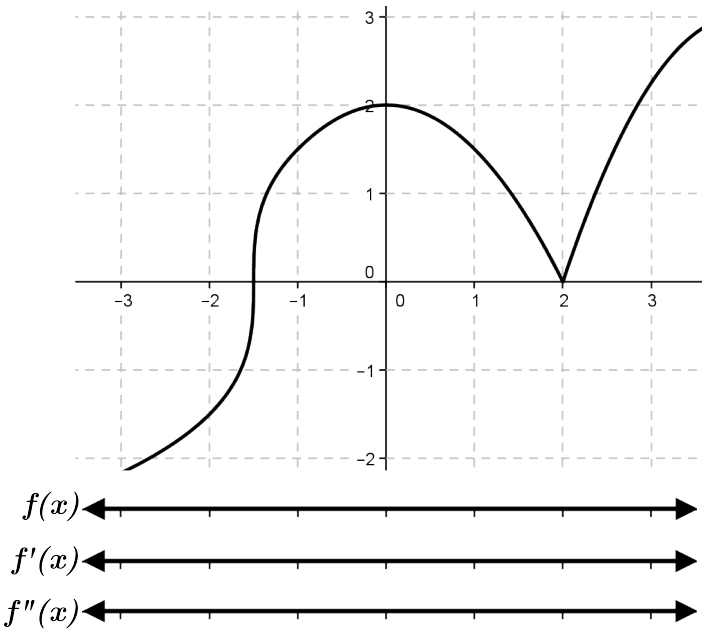
(d) What does the open circle at $x = 2$ on the number line for $f'(x)$ correspond to on the graph of $f(x)$?

(e) How does each + or − sign on the number line for $f'(x)$ relate to the graph?

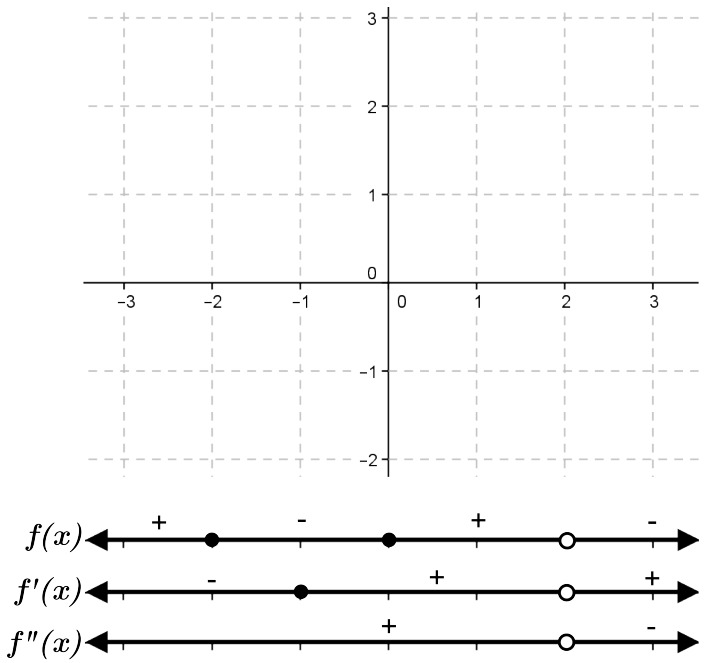
(f) What does the open circle at $x = 2$ on the number line for $f''(x)$ correspond to on the graph of $f(x)$?

(g) How does each + or − sign on the number line for $f''(x)$ relate to the graph?

2. For the graph of $f(x)$ shown below, fill in the number lines for $f(x)$, $f'(x)$ and $f''(x)$, marking closed circles where there is a zero, marking open circles for undefined points, and marking + and − signs on each interval to show positive/negativeness.

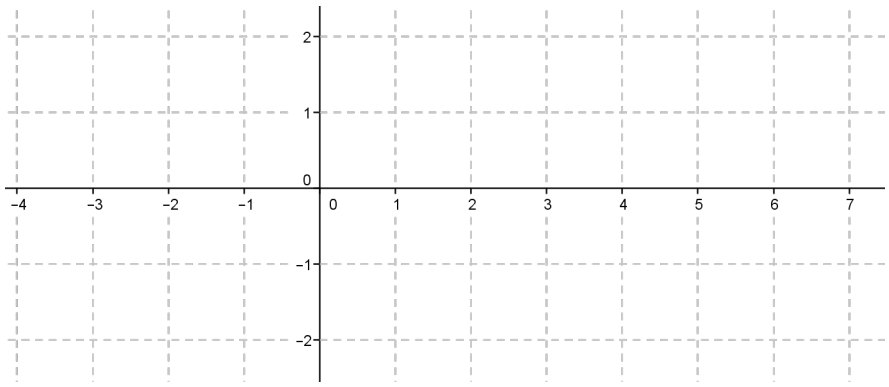


3. Draw a graph of $f(x)$ that fits the information shown in the number lines.

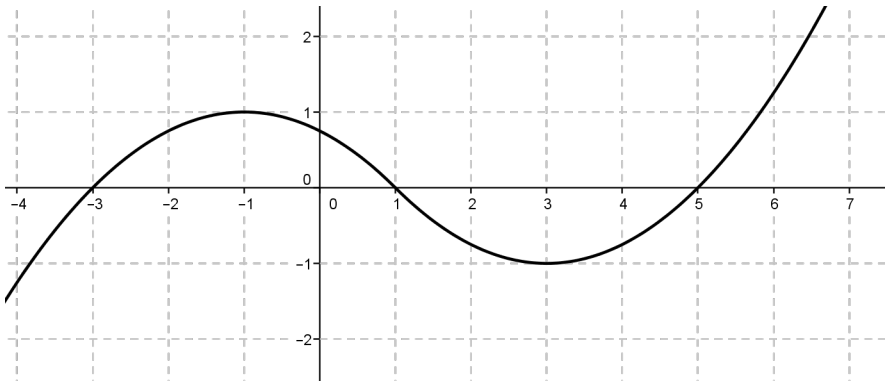


4. The middle graph drawn below shows $f'(x)$. Using the principles you learned in the previous problem, draw a possible graph of $f(x)$ above it, and a graph of $f''(x)$ below it. (If you are stuck try drawing the graph of $f''(x)$ first.)

$f(x)$:



$f'(x)$:



$f''(x)$: