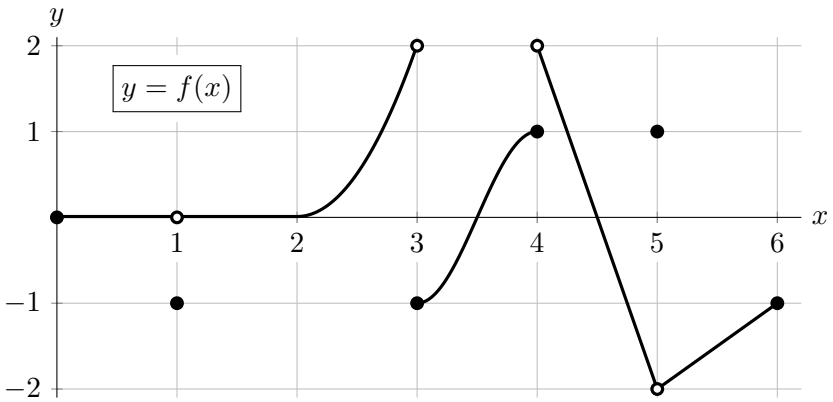
7. [12 points] The graph of the function $f(x)$ is shown below.



For **a.**–**c.**, give your answers as a list of one or more of the given numbers, or write NONE.

a. [1 point] At which of the values $a = 1, 2, 3, 4, 5$ is $f(a)$ undefined?

Solution: NONE

b. [1 point] For which of the values $a = 1, 2, 3, 4, 5$ is $f(x)$ continuous at $x = a$?

Solution: $a = 2$

c. [2 points] For which of the values $a = 1, 2, 3, 4, 5$ is $f(a) = \lim_{x \to a^-} f(x)$?

Solution: $a = 2,\ 4$

For **d.**–**g.**, use the graph of the function $f(x)$ to evaluate each of the expressions below. If a limit diverges to ∞ or $-\infty$ or if the limit does not exist for any other reason, write DNE.

d. [2 points] $\lim_{x \to 5} f(x)$

Solution: Since $\lim_{x \to 5^-} f(x) = -2$ and $\lim_{x \to 5^+} f(x) = -2$, the two-sided limit is -2.

e. [2 points] $\lim_{x \to 3} f(x)$

Solution: Since $\lim_{x \to 3^-} f(x) = 2$ while $\lim_{x \to 3^+} f(x) = -1$, the two-sided limit does not exist.

f. [2 points] $\lim_{x \to 0} f(4 + |x|)$

Solution: As x approaches 0 from both sides, $|x|$ approaces 0 through positive values. So $\lim_{x \to 0} f(4 + |x|) = \lim_{t \to 4^+} f(t) = 2$.

g. [2 points] $\lim_{h \to 0} \dfrac{f(4.25 + h) - f(4.25)}{h}$

Solution: This expression represents the slope of the tangent line to the graph of $g(x)$ at $x = 4.25$. On the interval $(4, 5)$ the graph is linear with slope -4; so the limit is -4.