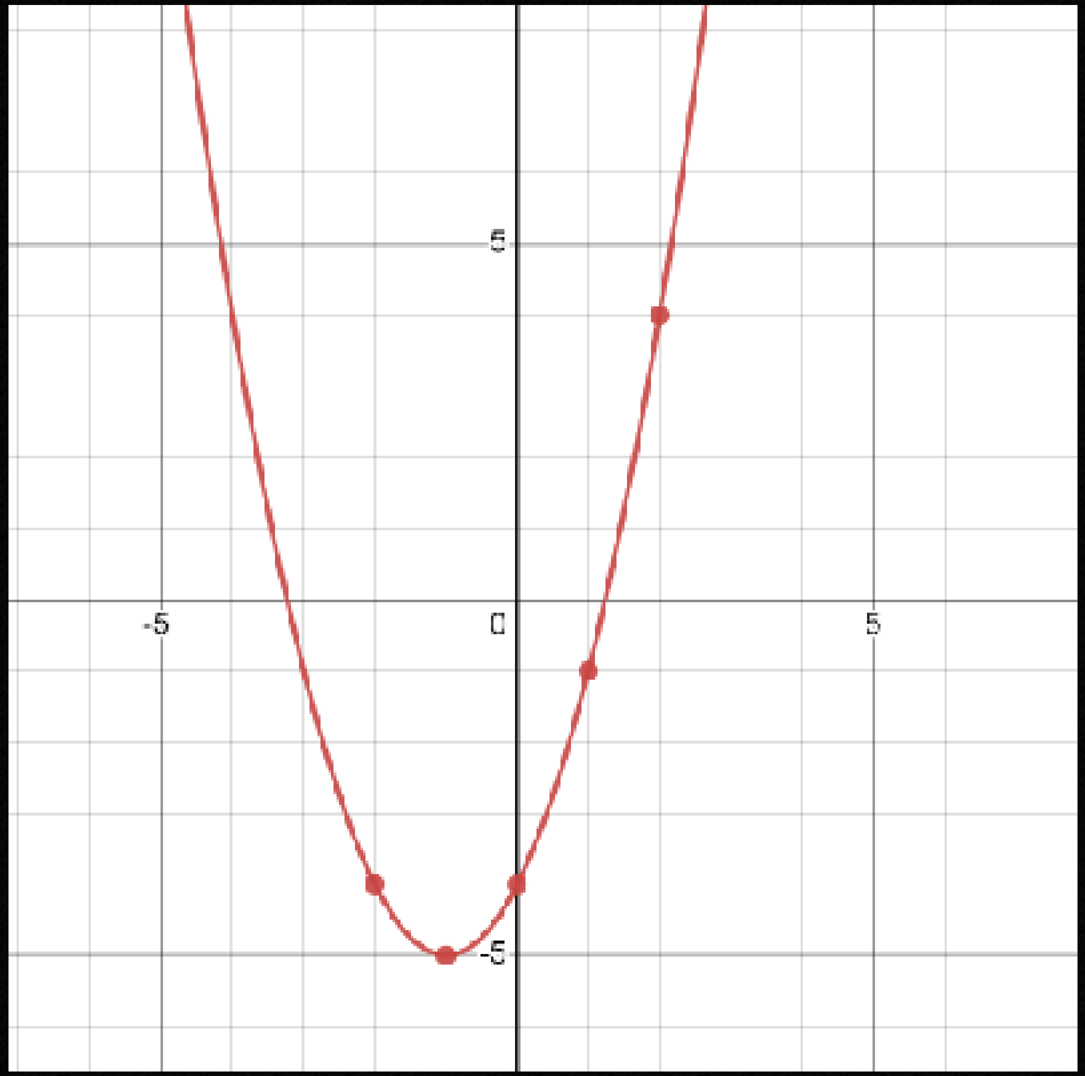
Represent the following function in four different ways:

$f(x) = x^2 + 2x - 4$

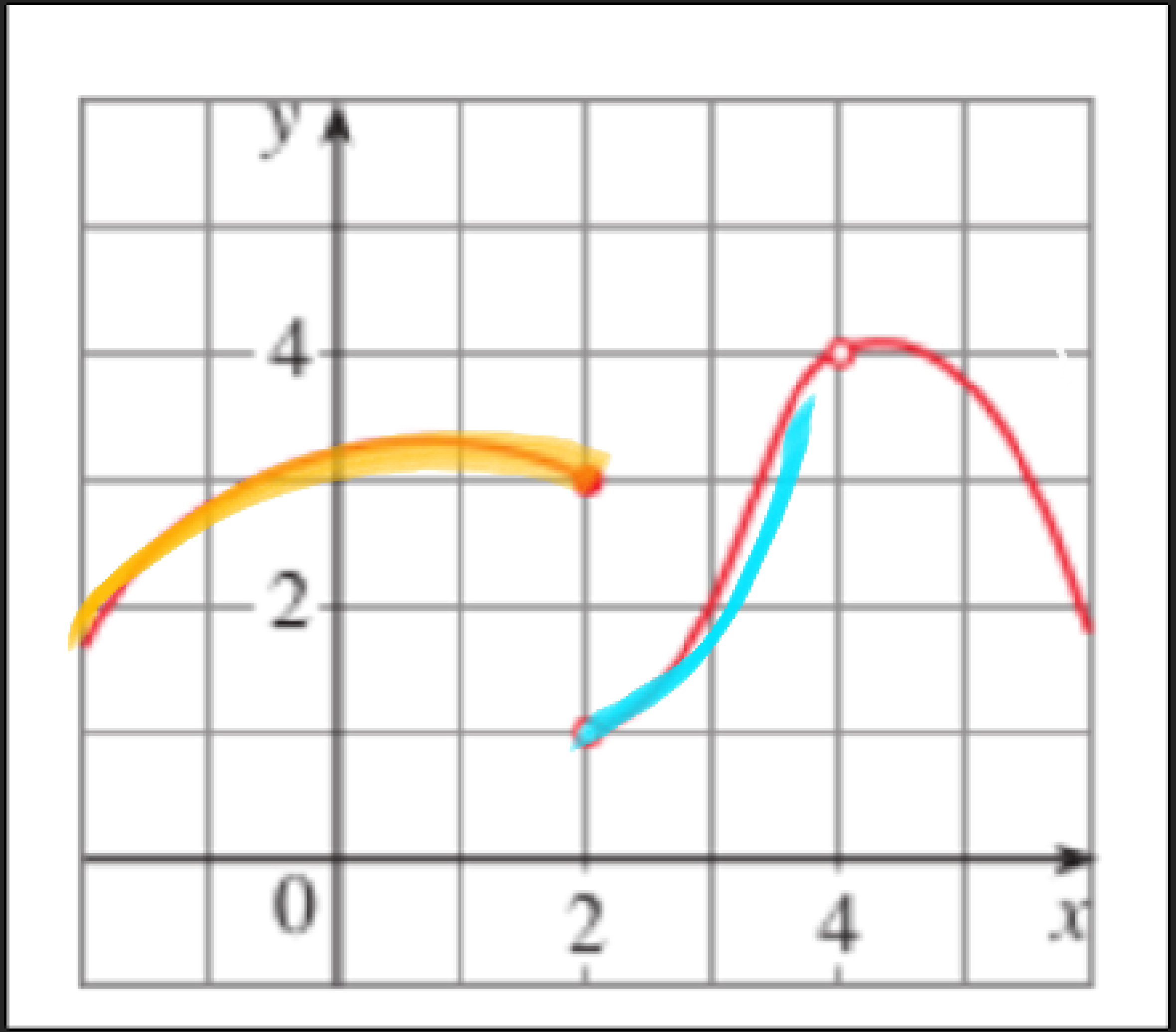
$f(x) = x^2 + 2x - 4$ models the path of a diver.

x	$x^2 + 2x - 4$
−2	−4
−1	−5
0	−4
1	−1
2	4



$f(x) = x^2 + 2x - 4$

Given the following graph of *f* state the value of each quantity if it exists. If it does not exist explain why.



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

b. $\lim_{x \to 2^+} f(x)$

c. $\lim_{x \to 2} f(x)$

$\lim_{x \to 2^-}$ from left 3

$\lim_{x \to 2^+}$ from right 1

$\lim_{x \to 2}$ both DNE

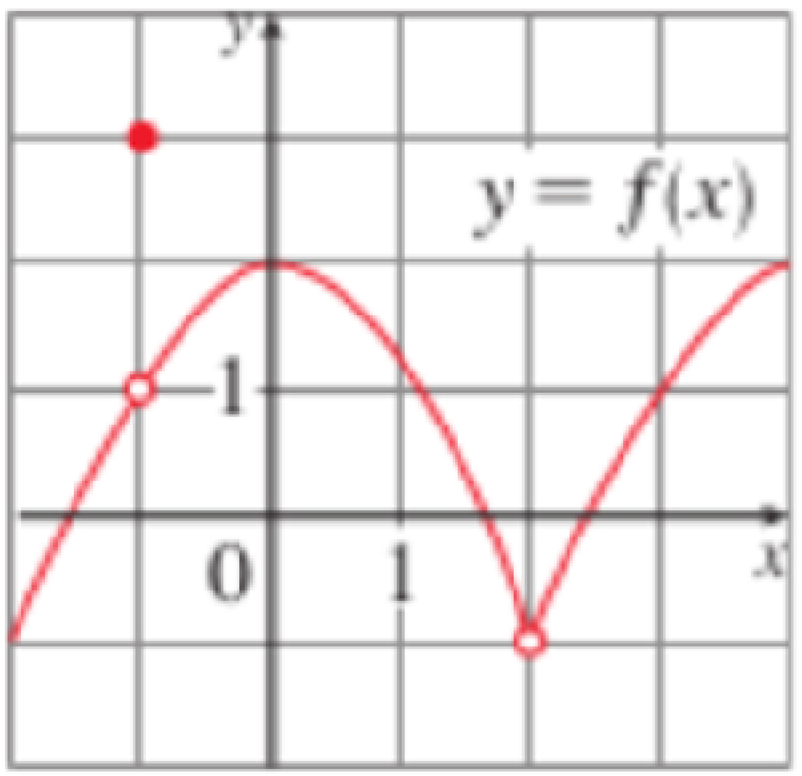
$$\lim_{t\to 0} \frac{e^{5t}-1}{t},$$

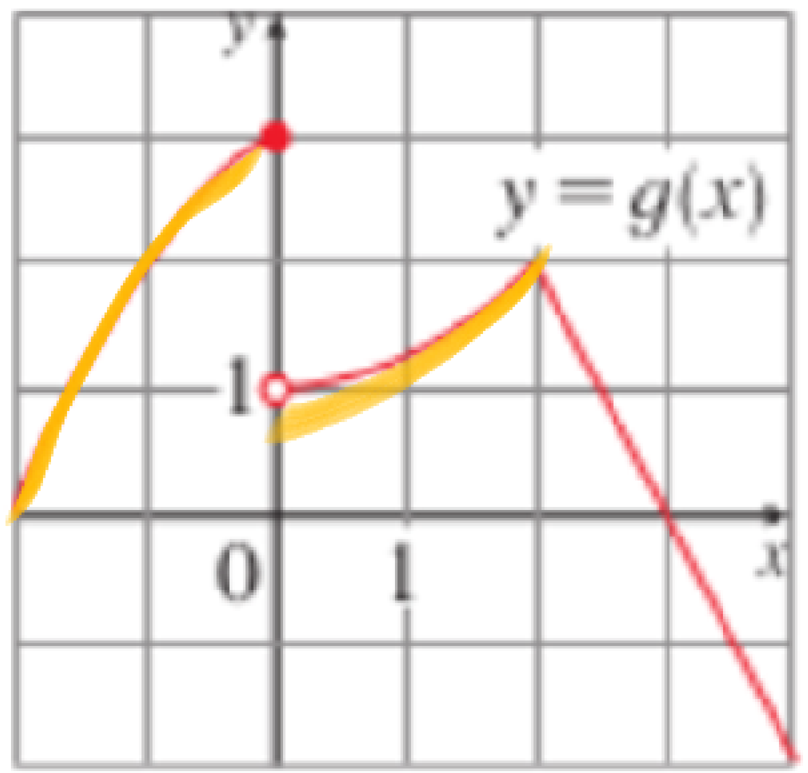
$$t = \pm 0.5, \pm 0.1, \pm 0.01, \pm 0.001, \pm 0.0001$$

$$\lim_{t\to 0} \frac{e^{5t}-1}{t} = 5$$

x	$\frac{e^{5x}-1}{x}$
-0.5	1.83583
-0.1	3.9346934
$-.01$	4.8770575
$-.001$	4.9875208
$-.0001$	4.9987502
.0001	5.0012502
.001	5.0125209
.01	5.1271096
.1	6.4872127
.5	22.364988

The graphs of f and g are given. Use them to evaluate each limit, if it exists. If the limit does not exist, explain why.





a. $\lim\limits_{x\to -1} \frac{f(x)}{g(x)}$

b. $\lim\limits_{x\to 3} f(x)g(x)$

c. $\lim\limits_{x\to 0} f(x)+g(x)$

$$\lim_{x\to -1} \frac{f(x)}{g(x)} = \frac{1}{2}$$

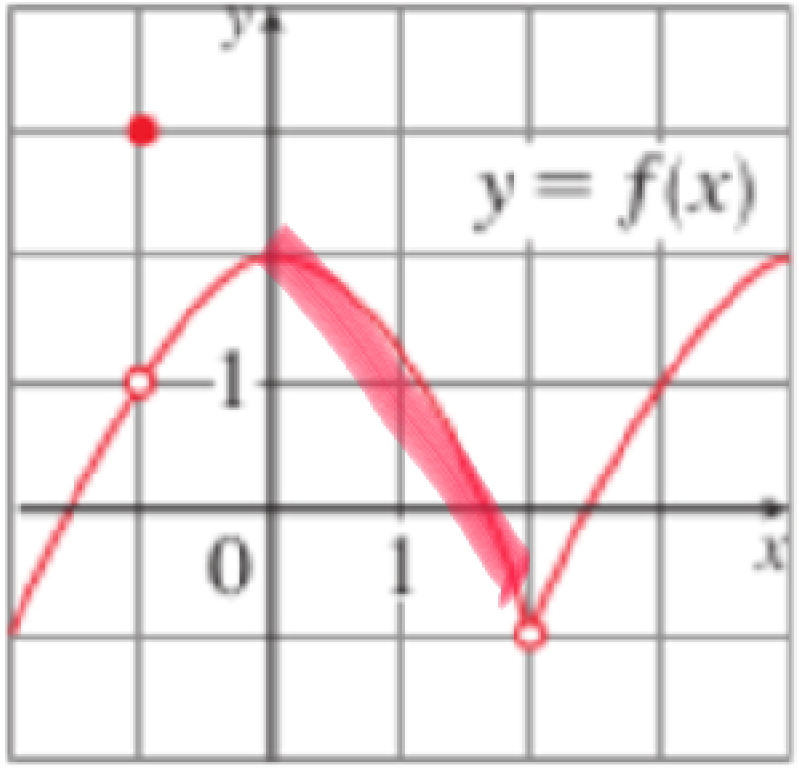
$$\lim_{x\to 3} f(x)g(x)$$

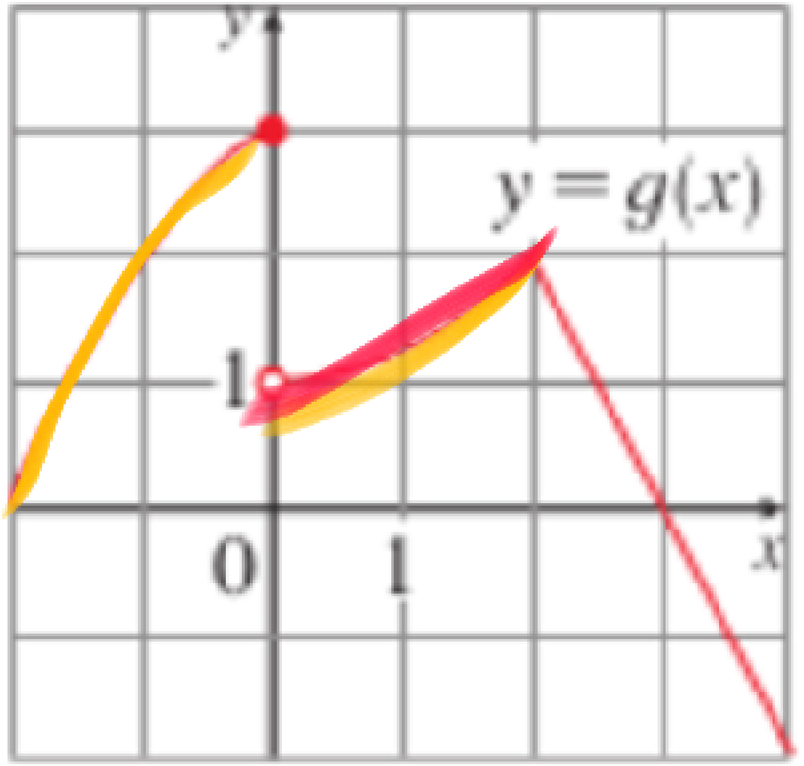
$$(1)(0) = 0$$

$$\lim_{x\to 0} f(x)+g(x) = 2 + \text{DNE}$$

$$= \text{DNE}$$

The graphs of f and g are given. Use them to evaluate each limit, if it exists. If the limit does not exist, explain why.





a. $\lim\limits_{x \to -1} \frac{f(x)}{g(x)}$

b. $\lim\limits_{x \to 3} f(x) g(x)$

c. $\lim\limits_{x \to 0} f(x) + g(x)$

$\lim\limits_{x \to -1} \frac{f(x)}{g(x)} = \frac{1}{2}$

$\lim\limits_{x \to 3} f(x) g(x)$

$(1)(0) = 0$

$\lim\limits_{x \to 0^+} f(x) + g(x) = 2 + 1 = 3$

$$\lim_{u \to -2} \sqrt{9 - u^3 + 2u^2}$$

$$\lim_{u \to -2} \sqrt{9-(-2)^3+2(-2)^2} = 5$$

$$9-(-8)+2(4)$$

$$\sqrt{25}$$

$$\lim_{t\to 4} \frac{t^2 - 2t - 8}{t - 4}$$

$$= \frac{(4)^2 - 2(4) - 8}{4 - 4} = \frac{0}{0}$$

$$\frac{\cancel{(t-4)}(t+2)}{\cancel{t-4}}$$

$$\lim_{t\to 4} t + 2 = \boxed{6}$$

$$\lim_{h\to 0} \frac{(h-3)^2-9}{h}$$

$$h^2-6h+9-9$$

$$h^2-6h$$

$$h(h-6)$$

$$\lim_{h\to 0} \frac{\cancel{h}(h-6)}{\cancel{h}}$$

$$\lim_{h\to 0} h-6 = -6$$

$$\frac{h^3 - 6\cancel{h^2}}{\cancel{h^2}}$$

Bad

$$\frac{\cancel{h^2}(h-6)}{\cancel{h^2}}$$

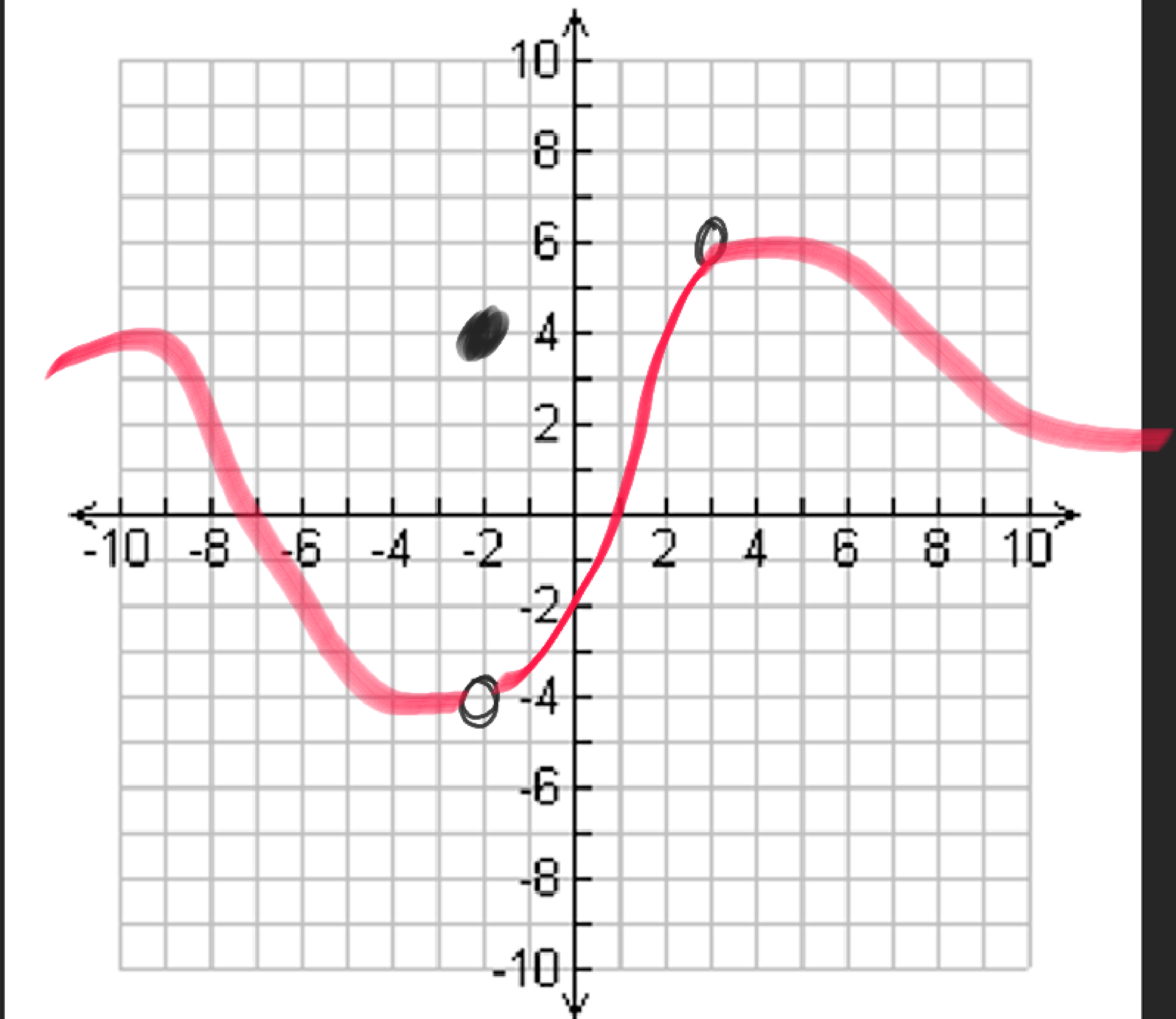
Good

Bad $(h-3)^2 \cancel{=} h^2 - 9$

Good $(h-3)^2 = (h-3)(h-3)$

$= h^2 - 6h - 9$

Sketch the graph of a function f that is defined on $\mathbb{R}$ and continuous and has a removable discontinuity at 3, and a jump discontinuity at −2.

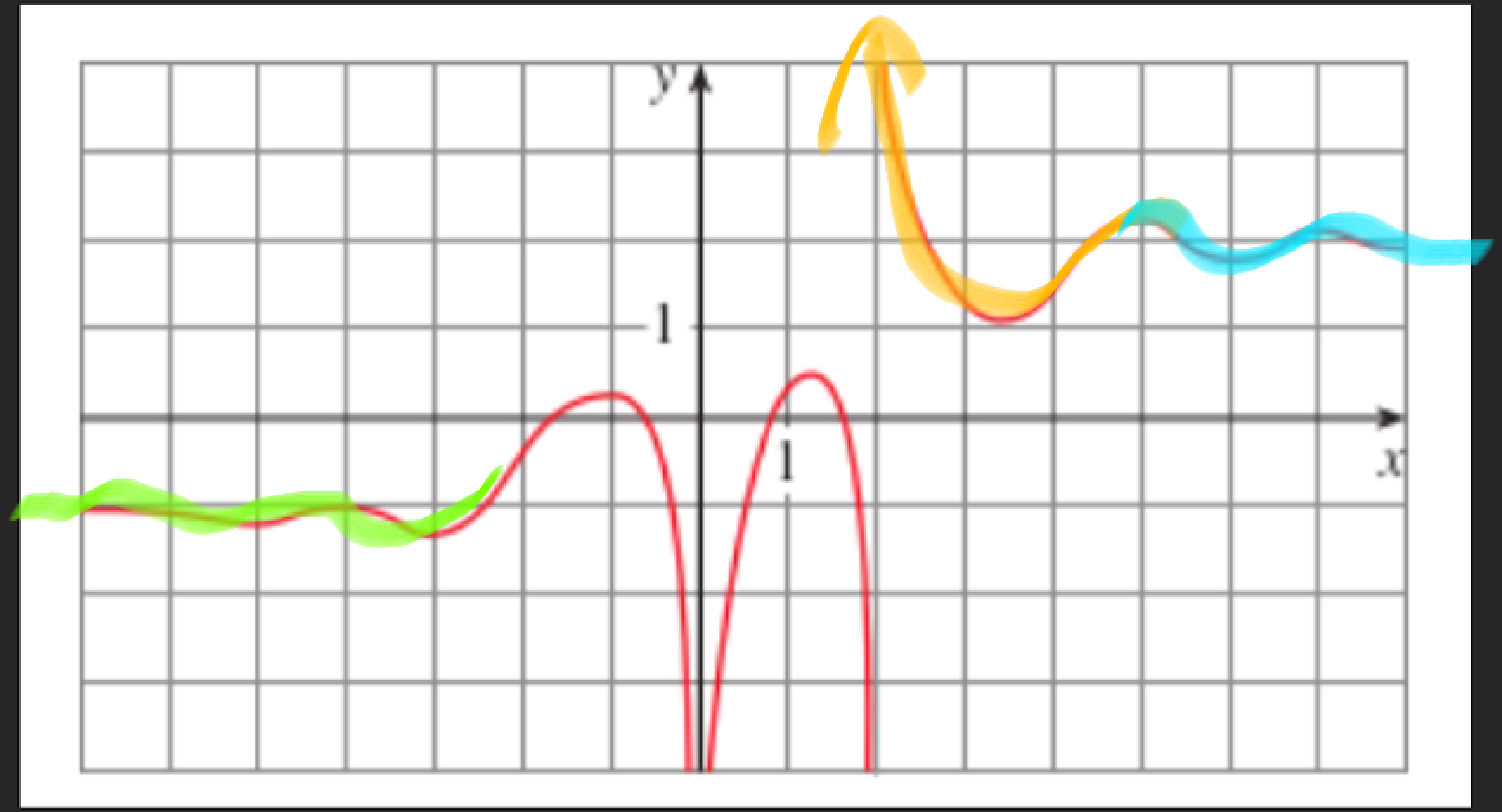


Removable disc
(hole)

Jump disc
(hole + point)

Vert Asy

For the function g whose graph is given state the following:



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

b. $\lim_{x\to \infty} f(x)$

c. $\lim_{x\to -\infty} f(x)$

$\lim_{x\to 2^+} = \infty$

$\lim_{x\to \infty} = 2$

$\lim_{x\to -\infty} = -1$

$$\lim_{t\to-\infty} \frac{3t^2+t}{t^3-4t+1}$$

$$\lim_{t\to-\infty} \frac{3(-\infty)^2+(-\infty)}{(-\infty)^3-4(-\infty)+1}$$

$$\lim_{t\to-\infty} \frac{3t^2}{t^3} \to \frac{3}{t} = 0$$

$$\lim_{t\to-\infty} \frac{3t^2/t^3 + t/t^3}{t^3/t^3 - 4t/t^3 + 1/t^3} = \frac{3/t + 1/t^2}{1 - 4/t^2 + 1/t^3} = 0$$