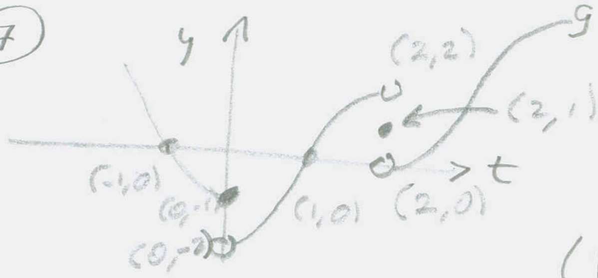
MAT 201 §2.2 #s 1, 2, 7, 9, 13, 15, 21, 33

① $\lim_{x\to 2} f(x)=5$ says "The limit, as x approaches 2, of f(x), is 5." This means that f(x) can be made arbitrarily close to 5 by taking x sufficiently close to 2, without x = 2.

This says nothing about f(2); it's all about what's happening in the neighborhood of x = 2.

② $\lim_{x\to 1^-} f(x)=3$ means "the limit, as x approaches 1 from the LEFT of f(x) is 3."
$\lim_{x\to 1^+} f(x)=7$ means "the limit as x approaches 1 from the RIGHT is 7." Since left- and right-hand limits disagree, $\lim_{x\to 1} f(x) \nexists$.

⑦



(c) $\lim_{t\to 0} g(t)$ $\boxed{\nexists}$

$\lim_{t\to 0^-} g(t) = -1 \neq -2 = \lim_{t\to 0^+} g(t)$

(b) $\boxed{\lim_{t\to 0^+} g(t) = -2}$

(a) $\boxed{\lim_{t\to 0^-} g(t) = -1}$

(d) $\boxed{\lim_{t\to 2^-} g(t) = 2}$

(e) $\boxed{\lim_{t\to 2^+} g(t) = 0}$

(f) $\boxed{\lim_{t\to 2} g(t) \nexists}$

(See d & e: They disagree.)

(g) $\boxed{g(2) = 1}$

(h) $\boxed{\lim_{t\to 4} g(t) = 3}$

MAT 201 Section 2.2 Homework

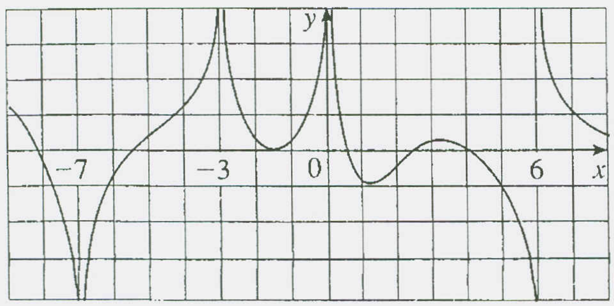
#s 1, 2, 7, 9, 13, 15, 31, 33

9. For the function f whose graph is shown, state the following.

(a) $\lim_{x \to -7} f(x)$ (b) $\lim_{x \to -3} f(x)$ (c) $\lim_{x \to 0} f(x)$

(d) $\lim_{x \to 6^-} f(x)$ (e) $\lim_{x \to 6^+} f(x)$

(f) The equations of the vertical asymptotes.



(a) $-\infty$

(b) $+\infty$

(c) $+\infty$

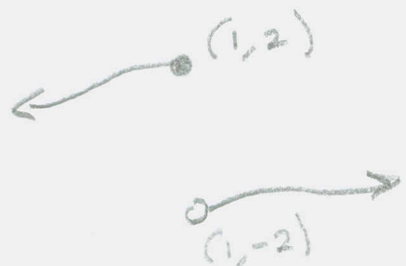
(d) $-\infty$

(e) $+\infty$

Context — 1pt
Graph — 1pt
Answers — 1pt

13–16 Sketch the graph of an example of a function f that satisfies all of the given conditions.

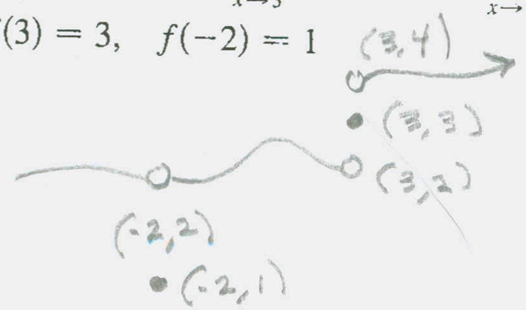
13. $\lim_{x \to 1^-} f(x) = 2$, $\lim_{x \to 1^+} f(x) = -2$, $f(1) = 2$



Or something like it.

3pts < Context – 1pt, Graph – 2pts

5. $\lim_{x \to 3^+} f(x) = 4$, $\lim_{x \to 3^-} f(x) = 2$, $\lim_{x \to -2} f(x) = 2$,
$f(3) = 3$, $f(-2) = 1$



Or something like it

Context – 1pt

Graph – 2pts

21–24 Use a table of values to estimate the value of the limit. If you have a graphing device, use it to confirm your result graphically.

21. $\displaystyle\lim_{x\to 0}\frac{\sqrt{x+4}-2}{x}$

Content, 1pt ; Table - 2pts

x	$\frac{\sqrt{x+4}-2}{x}$
-.1	.25158
-.01	.25016
-.001	.25002
-.0001	.25
.1	.24846
.01	.24984
.001	.24998
.0001	.25

33. Determine $\displaystyle\lim_{x\to 1^-}\frac{1}{x^3-1}$ and $\displaystyle\lim_{x\to 1^+}\frac{1}{x^3-1}$

(a) by evaluating $f(x) = 1/(x^3 - 1)$ for values of x that approach 1 from the left and from the right,

(b) by reasoning as in Example 9, and

(c) from a graph of f.

(a)

x	$\frac{1}{x^3-1}$
1.1	3.0211
1.01	33.002
1.001	333
1.0001	3333
.9	-3.69
.99	-33.67
.999	-333.7
.9999	-3334

$\displaystyle\lim_{x\to 1^-}\frac{1}{x^3-1} = -\infty$

$\displaystyle\lim_{x\to 1^+}\frac{1}{x^3-1} = +\infty$

1pt

(b) as $x \to 1$, $x^3 - 1 \to 0$

as $x \to 1^-$, $x^3 - 1 < 0$

as $x \to 1^+$, $x^3 - 1 > 0$

So, as $x \to 1^-$, 1pt

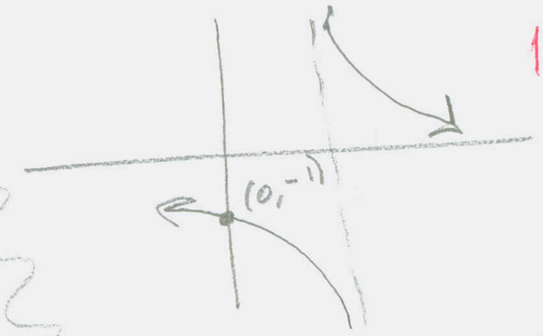
$\frac{1}{x^3-1} \longrightarrow -\infty$ and,

as $x \to 1^+$, $\frac{1}{x^3-1} \longrightarrow +\infty$

$\displaystyle\lim_{x\to 1^-}\frac{1}{x^3-1} = -\infty$, $\displaystyle\lim_{x\to 1^+}\frac{1}{x^3-1} = +\infty$

(c) $\frac{1}{x^3-1} = \frac{1}{(x-1)(x^2+x+1)}$

1pt



$\displaystyle\lim_{x\to 1^-}\frac{1}{x^3-1} = -\infty$

& $\displaystyle\lim_{x\to 1^+}\frac{1}{x^3-1} = +\infty$