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1. As x approaches 2, $f(x)$ approaches 5. [Or, the values of $f(x)$ can be made as close to 5 as we like by taking x sufficiently close to 2 (but $x \neq 2$).] Yes, the graph could have a hole at $(2, 5)$ and be defined such that $f(2) = 3$.

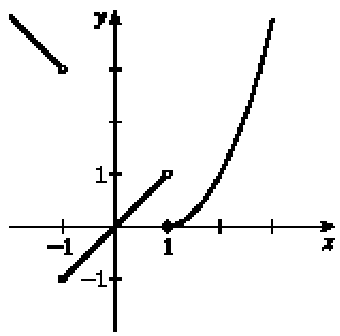
2. As x approaches 1 from the left, $f(x)$ approaches 3; and as x approaches 1 from the right, $f(x)$ approaches 7. No, the limit does not exist because the left- and right-hand limits are different.

4. (a) $\lim_{x\to 0} f(x) = 3$ (b) $\lim_{x\to 3^-} f(x) = 4$ (c) $\lim_{x\to 3^+} f(x) = 2$

(d) $\lim_{x\to 3} f(x)$ does not exist because the limits in part (b) and part (c) are not equal.

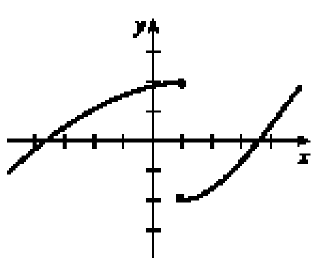
(e) $f(3) = 3$

6. $\lim_{x\to a} f(x)$ exists for all a except $a = \pm 1$.



8. $\lim_{t\to 12^-} f(t) = 150$ mg and $\lim_{t\to 12^+} f(t) = 300$ mg. These limits show that there is an abrupt change in the amount of drug in the patient's bloodstream at $t = 12$ h. The left-hand limit represents the amount of the drug just before the fourth injection. The right-hand limit represents the amount of the drug just after the fourth injection.

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



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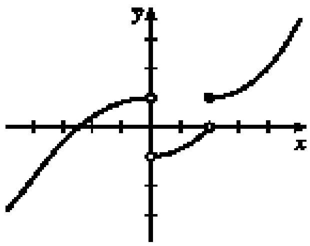
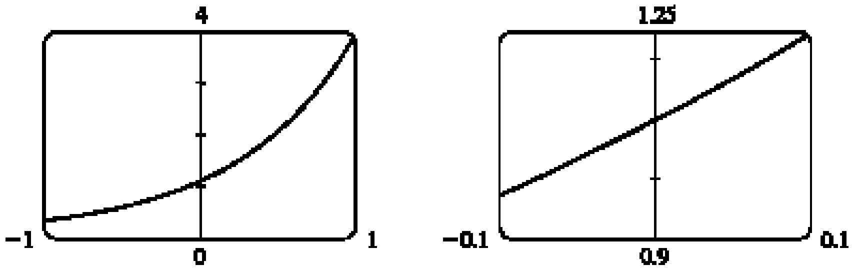
10. $\lim_{x\to 0^-} f(x) = 1$, $\lim_{x\to 0^+} f(x) = -1$, $\lim_{x\to 2^-} f(x) = 0$,

$\lim_{x\to 2^+} f(x) = 1$, $f(2) = 1$, $f(0)$ is undefined



22. (a) From the following graphs, it seems that $\lim_{x\to 0} \frac{6^x - 2^x}{x} \approx 1.10$.



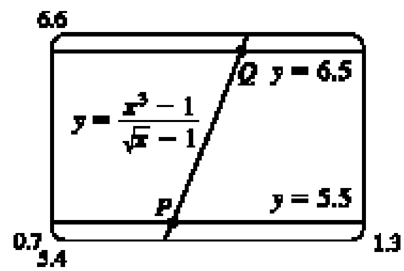
(b)

x	$f(x)$
-0.01	1.085052
-0.001	1.097248
-0.0001	1.098476
0.0001	1.098749
0.001	1.099978
0.01	1.112353

28. (a) Let $y = (x^3 - 1)/(\sqrt{x} - 1)$.

From the table and the graph, we guess that the limit of y as x approaches 1 is 6.

x	y
0.99	5.92531
0.999	5.99250
0.9999	5.99925
1.01	6.07531
1.001	6.00750
1.0001	6.00075



(b) We need to have $5.5 < \frac{x^3 - 1}{\sqrt{x} - 1} < 6.5$. From the graph we obtain the approximate points of intersection $P(0.9313853, 5.5)$ and $Q(1.0649004, 6.5)$. Now $1 - 0.9313853 \approx 0.0686$ and $1.0649004 - 1 \approx 0.0649$, so by requiring that x be within 0.0649 of 1, we ensure that y is within 0.5 of 6.