

# 2011 Chapter One Review Warm-ups

Draw a graph which has the following attributes:

(a)  $\lim_{x \rightarrow -2} f(x) = 3$

(b)  $f(-2) = 1$

(c)  $\lim_{x \rightarrow -4} f(x) = \infty$

(d)  $\lim_{x \rightarrow 3} f(x) = 4$

(e)  $f(3) = 4$

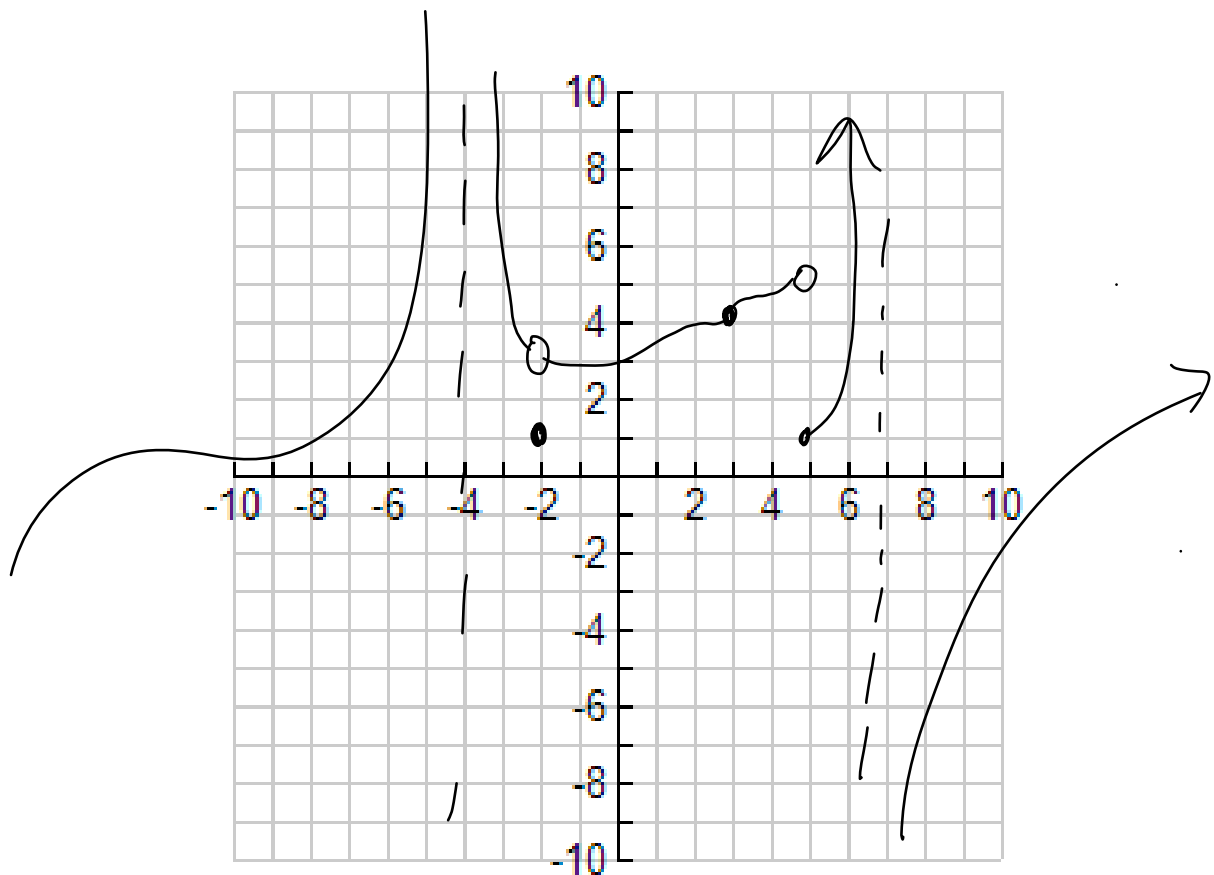
(f)  $\lim_{x \rightarrow 5^-} f(x) = 5$

(g)  $\lim_{x \rightarrow 5^+} f(x) = 1$

(h)  $f(5) = 1$

(i)  $\lim_{x \rightarrow 7^-} f(x) = \infty$

(j)  $\lim_{x \rightarrow 7^+} f(x) = -\infty$



1. What is  $\lim_{x \rightarrow 3} \frac{(3-x^2)}{(x-3)}$  ?

(A) -2

(B) -1

(C) 0

(D) 1

(E) The limit does not exist

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28.  $\lim_{x \rightarrow 1} \frac{x}{\ln x}$  is

(A) 0

(B) 1

(C)  $e$

(D)  $\frac{1}{e}$

(E) nonexistent

3. A function  $f(x)$  has a vertical asymptote at  $x=2$ . The graph of  $f(x)$  is increasing for all  $x \neq 2$ . Which of the following statements are true?

I.  $\lim_{x \rightarrow 2} f(x) = +\infty$

II.  $\lim_{x \rightarrow 2^+} f(x) = +\infty$

III.  $\lim_{x \rightarrow 2^-} f(x) = +\infty$

(A)  
(C)

I only

(B) II only

III only

(D) I and II only

(E)

I, II, and III

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$x$	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	6	4	2	5
2	9	2	3	1
3	10	-4	4	2
4	-1	3	6	7

3. The functions  $f$  and  $g$  are differentiable for all real numbers, and  $g$  is strictly increasing. The table above gives values of the functions and their first derivatives at selected values of  $x$ . The function  $h$  is given by  $h(x) = f(g(x)) - 6$ .

(a) Explain why there must be a value  $r$  for  $1 < r < 3$  such that  $h(r) = -5$ .

$$\begin{aligned}
 h(1) &= f(g(1)) - 6 \\
 &= f(2) - 6 && h(1) = 3 \\
 &= 9 - 6 \\
 h(3) &= f(g(3)) - 6 && h(3) = -7 \\
 &= f(4) - 6 \\
 &= -1 - 6
 \end{aligned}$$

By the IVT, there is an  $r$ ,  $1 < r < 3$ , such that  $h(3) < h(r) < h(1)$ . Since  $h(3) = -7$  and  $h(1) = 3$ , then there is an  $r$ ,  $1 < r < 3$ , such that  $-7 < h(r) < 3$ .  
 Hence, there is an  $r$ ,  $1 < r < 3$ , such that  $h(r) = -5$ .