

Non-AP Calculus Chapter 1 Limits Test Review Worksheet #2

1) For the function $f(x) = \begin{cases} \frac{4x^2+10x-6}{x+3}, & x \neq -3 \\ 12, & x = -3 \end{cases}$

Use continuity condition to show that $g(x)$ is discontinuous at $x = -3$ and state why it is discontinuous there. Determine type of discontinuity if function is not continuous at $x = -3$

2) If $f(x) = \begin{cases} 1 - 3x^2, & x < 1 \\ 5, & x = 1 \\ 3x - 2, & x > 1 \end{cases}$, then find the following

a) $\lim_{x \rightarrow 1} f(x) =$

b) $f(1) =$

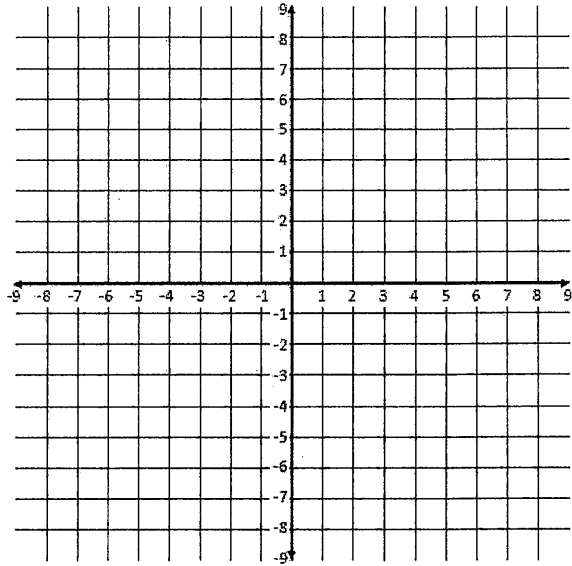
c) Use continuity condition to determine if function is continuous or not continuous at $x = 1$ (If not continuous, determine type of discontinuity)

3) Verify that the Intermediate Value Theorem applies to the indicated interval and find the value of c guaranteed by the theorem

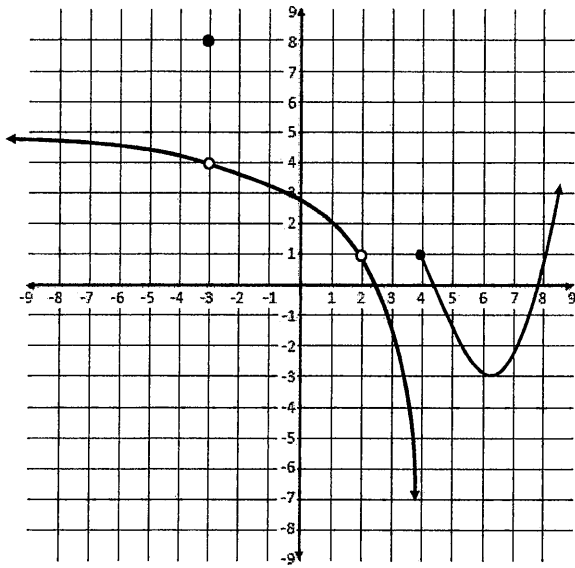
$f(x) = x^2 - 4x + 2$ in the interval $[-3, 1]$ $f(c) = 7$

4) . Sketch a possible graph for function $f(x)$ with the following properties:

- $f(-6) = 6$
- $\lim_{x \rightarrow -6} f(x) = -2$
- $\lim_{x \rightarrow -3^-} f(x) = -\infty$
- $\lim_{x \rightarrow -3^+} f(x) = 4$
- $\lim_{x \rightarrow 4} f(x)$ does not exist
- $\lim_{x \rightarrow -\infty} f(x) = -4$
- $\lim_{x \rightarrow \infty} f(x) = \infty$
- $f(4) = -6$



5) Find the following:



- a) $\lim_{x \rightarrow -3^-} f(x) =$ _____ b) $\lim_{x \rightarrow -3^+} f(x) =$ _____ c) $f(-3) =$ _____
- d) $\lim_{x \rightarrow 1} f(x) =$ _____ e) $\lim_{x \rightarrow 2} f(x) =$ _____ f) $f(2) =$ _____
- g) $\lim_{x \rightarrow 4} f(x) =$ _____ h) $\lim_{x \rightarrow \infty} f(x) =$ _____ i) $\lim_{x \rightarrow -\infty} f(x) =$ _____

1) For the function $f(x) = \begin{cases} 2(2x^2+5x-3) \rightarrow 2(2x-1)(x+3) \\ \frac{4x^2+10x-6}{x+3}, & x \neq -3 \\ 12, & x = -3 \end{cases}$

Use continuity condition to show that $g(x)$ is discontinuous at $x = -3$ and state why it is discontinuous there. Determine type of discontinuity if function is not continuous at $x = -3$

i) $f(-3) = 12$

ii) $\lim_{x \rightarrow -3^-} \frac{4x^2+10x-6}{x+3} \rightarrow \lim_{x \rightarrow -3^-} \frac{2(2x-1)(x+3)}{(x+3)} = -14$ $\lim_{x \rightarrow -3^+} \frac{4x^2+10x-6}{x+3} = -14$ $\lim_{x \rightarrow -3} \frac{4x^2+10x-6}{x+3} = -14$

iii) $f(-3) \neq \lim_{x \rightarrow -3} f(x)$ Removable Discontinuity at $x = -3$

2) If $f(x) = \begin{cases} 1-3x^2, & x < 1 \\ 5, & x = 1 \\ 3x-2, & x > 1 \end{cases}$, then find the following

a) $\lim_{x \rightarrow 1} f(x) =$

$\lim_{x \rightarrow 1^-} 1-3x^2 = -2$
 $\lim_{x \rightarrow 1^+} 3x-2 = 1$
 } $\lim_{x \rightarrow 1} f(x)$ Does not exist

b) $f(1) = 5$

c) Use continuity condition to determine if function is continuous or not continuous at $x = 1$ (If not continuous, determine type of discontinuity)

i) $f(1) = 5$

ii) $\lim_{x \rightarrow 1} f(x)$ Does Not Exist Nonremovable Discontinuity at $x = 1$

3) Verify that the Intermediate Value Theorem applies to the indicated interval and find the value of c guaranteed by the theorem

$f(x) = x^2 - 4x + 2$ in the interval $[-3, 1]$ $f(c) = 7$

$f(x)$ continuous on $[-3, 1]$

$f(-3) = 9 + 12 + 2 = 23$

$f(1) = 1 - 4 + 2 = -1$

By IVT, $f(c) = 7$ on $[-3, 1]$

$x^2 - 4x + 2 = 7$

$x^2 - 4x - 5 = 0$

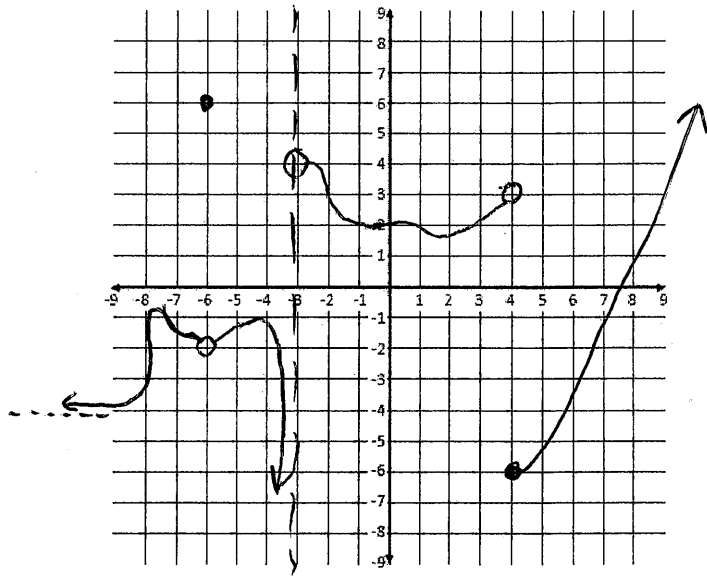
$(x-5)(x+1) = 0$

~~$x = 5$~~ , $x = -1$

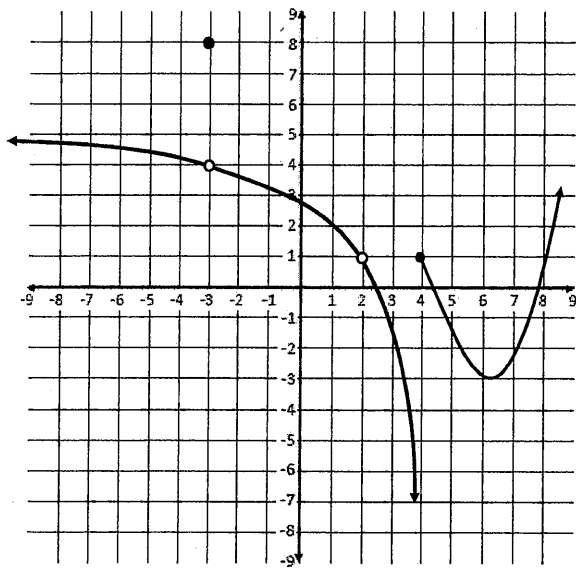
$c = -1$

4) . Sketch a possible graph for function $f(x)$ with the following properties:

- $f(-6) = 6$ ✓
- $\lim_{x \rightarrow -6} f(x) = -2$ ✓
- $\lim_{x \rightarrow -3^-} f(x) = -\infty$ ✓
- $\lim_{x \rightarrow -3^+} f(x) = 4$ ✓
- $\lim_{x \rightarrow 4} f(x)$ does not exist ✓
- $\lim_{x \rightarrow -\infty} f(x) = -4$ ✓
- $\lim_{x \rightarrow \infty} f(x) = \infty$ ✓
- $f(4) = -6$ ✓



5) Find the following:



a) $\lim_{x \rightarrow -3^-} f(x) = 4$

b) $\lim_{x \rightarrow -3^+} f(x) = 4$

c) $f(-3) = 8$

d) $\lim_{x \rightarrow 1} f(x) = 2$

e) $\lim_{x \rightarrow 2} f(x) = 1$

f) $f(2) = \text{undefined}$

g) $\lim_{x \rightarrow 4} f(x) = \text{D.N.E.}$

h) $\lim_{x \rightarrow \infty} f(x) = +\infty$

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