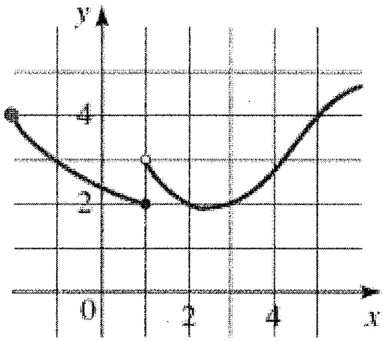
Non-AP Calculus 1.4-1.5 Quiz Review

State why each of the graphs of the functions below are not continuous. Your answer must involve conditions for continuity. Then determine type of discontinuity.

1) c = 2

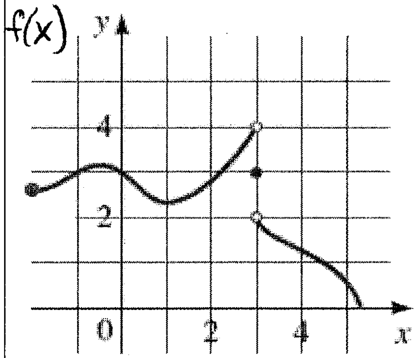
f(x)



____

2) c = 3

f(x)



____

3. For $f(x) = \begin{cases} 2x - 3\ , & x < 1 \\ 3x - 1, & x \geq 1 \end{cases}$, use Continuity Conditions to show that f(x) is discontinuous at x = 1 and state why it is discontinuous there. Then determine if the discontinuity is removable or non-removable and state why.

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

$f(x) = x^2 - 5x - 3$ in the interval [0, 7] f(c) = 3

Find the following:

5) $\lim_{x \to 2^-} \frac{2x^2-3x-2}{x-2} =$

6) $\lim_{x \to 4^+} \frac{x^2-3x-4}{x-1} =$

7) $\lim_{x \to 1^-} \frac{2x+1}{x-1} =$

8) $\lim_{x \to 3^-} \frac{3x^2-1}{x^2-9} =$

9) $\lim_{x \to 3^+} \frac{3x^2-1}{x^2-9}$

10) $\lim_{x \to 3} \frac{3x^2-1}{x^2-9}$

11) $\lim_{x \to -2^+} \frac{x^2-16}{4-x^2} =$

12) $\lim_{x \to -2^-} \frac{x^2-3}{4-x^2} =$

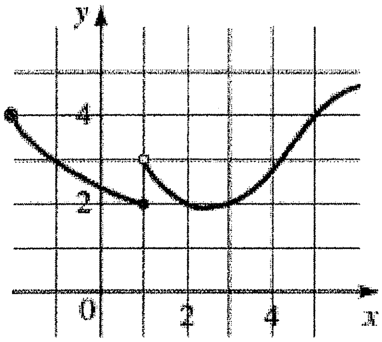
Non-AP Calculus **1.4-1.5 Quiz Review**

$\boxed{\text{Key}}$

State why each of the graphs of the functions below are not continuous. Your answer must involve conditions for continuity

1) c = 2

f(x)



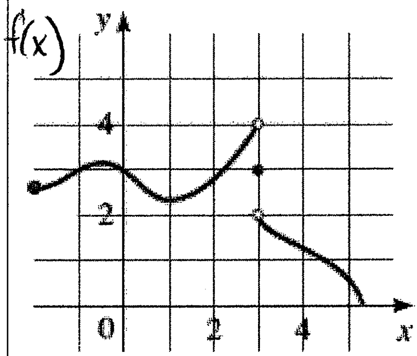
i) $f(1) = 2$

ii) $\lim_{x\to1^-} f(x) = 2$ $\lim_{x\to1^+} f(x) = 3$ $\lim_{x\to1} f(x) = \text{DNE}$

Nonremovable Discontinuity at $x = 1$

2) c = 3

f(x)



i) $f(3) = 3$

ii) $\cancel{\lim_{x\to3^-} f(x) = 4}$ $\lim_{x\to3^+} f(x) = 2$ $\lim_{x\to3} f(x) = \text{DNE}$

Nonremovable Discontinuity at $x = 3$

3. $f(x) = \begin{cases} 2x - 3\ , & x < 1 \\ 3x - 1, & x \geq 1 \end{cases}$, use Continuity Conditions to show that f(x) is discontinuous at x = 1 and state why it is discontinuous there. Then determine if the discontinuity is removable or non-removable and state why.

i) $f(1) = 3(1) - 1 = 2$

ii) $\lim_{x\to1^-} 2x - 3 = -1$ $\lim_{x\to1^+} 3x - 1 = 2$ $\lim_{x\to1} f(x) = \text{DNE}$

Nonremovable Discontinuity at $x = 1$

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

$f(x) = x^2 - 5x - 3$ in the interval [0, 7] f(c) = 3

f(x) continuous [0, 7]

$f(0) = 0 + 0 - 3 = -3$

$f(7) = 7^2 - 5(7) - 3 = 11$

By IVT, $f(c) = 3$ in [0, 7]

$3 = x^2 - 5x - 3$

$0 = x^2 - 5x - 6$

$0 = (x - 6)(x + 1)$

$x = 6, -1$

$\boxed{c = 6,\ \cancel{c = -1}}$

Find the following:

5) $\lim\limits_{x\to 2^-}\frac{2x^2-3x-2}{x-2} = \frac{2(2)^2-3(2)-2}{2-2} = \frac{0}{0}$

$\lim\limits_{x\to 2^-}\frac{(2x+1)\cancel{(x-2)}}{\cancel{(x-2)}} = 2(2)+1 = \boxed{5}$

6) $\lim\limits_{x\to 4^+}\frac{x^2-3x-4}{x-1} = \frac{4^2-3(4)-4}{4-1} = \frac{0}{3} = \boxed{0}$

7) $\lim\limits_{x\to 1^-}\frac{2x+1}{x-1} = \frac{2(1)+1}{1-1} = \frac{3}{0}$ $+\infty$ $-\infty$

0.9 $\frac{2(0.9)+1}{0.9-1} = \frac{+}{-} = \boxed{-\infty}$

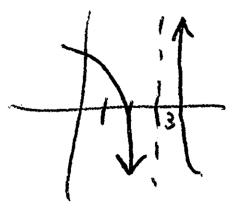
8) $\lim\limits_{x\to 3^-}\frac{3x^2-1}{x^2-9} = \frac{26}{0}$ $+\infty$ $-\infty$

2.9 $\frac{3(2.9)^2-1}{(2.9)^2-9} = \frac{+}{-} = \boxed{-\infty}$

9) $\lim\limits_{x\to 3^+}\frac{3x^2-1}{x^2-9}$ $\frac{26}{0}$ $+\infty$ $-\infty$

3.1 $\frac{3(3.1)^2-1}{(3.1)^2-9} = \frac{+}{+} = \boxed{+\infty}$

10) $\lim\limits_{x\to 3}\frac{3x^2-1}{x^2-9}$ $\frac{26}{0} = \boxed{\text{DNE}}$



11) $\lim\limits_{x\to -2^+}\frac{x^2-16}{4-x^2} = \frac{(-2)^2-16}{4-(-2)^2} = \frac{-12}{0}$ $+\infty$ $-\infty$

-1.9 $\frac{(-1.9)^2-16}{4-(-1.9)^2} = \frac{-}{+} = \boxed{-\infty}$

12) $\lim\limits_{x\to -2^-}\frac{x^2-3}{4-x^2} = \frac{(-2)^2-3}{4-(-2)^2} = \frac{1}{0}$ $+\infty$ $-\infty$

-2.1 $\frac{(-2.1)^2-3}{4-(-2.1)^2} = \frac{+}{-} = \boxed{-\infty}$