$$\lim_{x\to 3}\left(\frac{x^2+2dx-d+6}{x^2-3x}\right)$$

TASK = FIGURE OUT IF THERE EXISTS A VALUE FOR d SUCH THAT THE LIMIT EXISTS.

Maths $\frac{15}{15}$

$$\frac{x^2+2dx-d+6}{x^2-3x} = f(x)$$

$$x^2+2dx-d+6 = g(x)$$

$$x^2-3x = p(x)$$

$\exists \lim_{x\to 3} f(x)$ if $\lim_{x\to 3^+} f(x) = \lim_{x\to 3^-} f(x)$

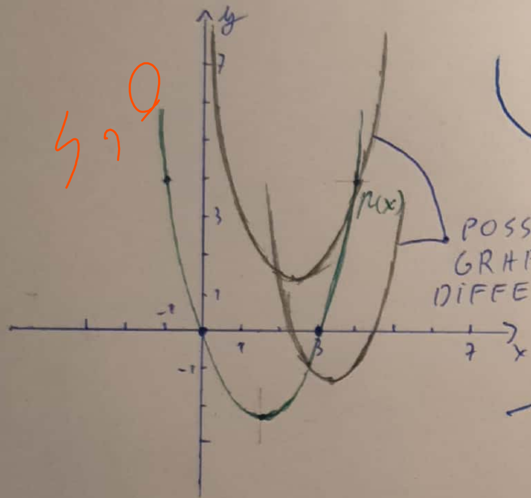
Solve $\frac{12}{15}$

- if $g(3) > 0$ $\lim_{x\to 3} g(x) > 0$
- if $g(3) < 0$ $\lim_{x\to 3} g(x) < 0$
- $\lim_{x\to 3^+} p(x) = 0^+$
- $\lim_{x\to 3^-} p(x) = 0^-$

BECAUSE OF THESE FOUR BULLET POINTS $g(3)$ CAN NOT BE ANYTHING OTHER THAN 0. EQUAL TO

IF $g(3) \in (-\infty; 3) \cup (3; +\infty)$ $\lim_{x\to 3^+}\left(\frac{g(x)}{p(x)}\right)$ AND $\lim_{x\to 3^-}\left(\frac{g(x)}{p(x)}\right)$ ABSOLUTE VALUES ARE GREATER THAN 0 AND THEIR VALUE POLARITIES DIFFER; THEREFORE, THE LIMITS ARE NOT EQUAL.

5?9



POSSIBLE $g(x)$ GRAPHS AT 2 DIFFERENT d VALUES

$$g(3) = 0$$
$$x^2+2dx-d+6=0$$
$$9+6d-d+6=0$$
$$5d=-15$$
$$d=-3$$

why? ✓

$$f(x) = \frac{x^2-6x+9}{x^2-3x} = \frac{(x-3)^2}{x(x-3)} = \frac{x-3}{x}$$

$$\lim_{x\to 3}\frac{x^2-6x+9}{x^2-3x} = \lim_{x\to 3}\frac{(x-3)^2}{x(x-3)} = \lim_{x\to 3}\frac{x-3}{x} = 0$$

5/5

FB1

A WHOLE NUMBER CAN BE EITHER ODD OR EVEN.

AN EVEN NUMBER FORMULA $n = 2\mathbb{Z}$?

AN ODD NUMBER FORMULA $n = (2\mathbb{Z} + 1)$

*AN EVEN NUMBER MULTIPLIED BY ITSELF OR ANOTHER EVEN NUMBER ALWAYS RESULTS IN ANOTHER EVEN NUMBER.

$$2K_1 \cdot 2K_2 = 4K_1K_2 \ , \quad 4K_1K_2 \ \vdots \ 2 \qquad (K_1 \text{ and } K_2 \in \mathbb{Z})$$

*AN ODD NUMBER MULTIPLIED BY ITSELF OR ANOTHER ODD NUMBER ALWAYS RESULTS IN ANOTHER ODD NUMBER.

$$(2K_1 + 1) \cdot (2K_2 + 1) = 4K_1K_2 + 2K_1 + 2K_2 + 1 \quad (\text{NOT DIVISIBLE BY } 2)$$

$$\frac{4K_1K_2 + 2K_1 + 2K_2 + 1}{2} = 2K_1K_2 + K_1 + K_2 + \frac{1}{2}$$

FB$_2$

I'VE PROOVED THAT IF AN ODD NUMBER IS MULTIPLIED BY ANOTHER ODD NUMBER THE RESULT IS ODD AND THAT AN EVEN NUMBER IF MULTIPLIED BY ANOTHER RESULTS IN AN EVEN NUMBER.

THEREFORE IF $n^3 = $ EVEN THEN $n = $ EVEN

A SPECIFIC EXAMPLE FOR $n^3 = $ EVEN, WHY n CAN NOT BE ODD.

$$n = 2R + 1 \ , \quad R \in \mathbb{Z}$$

$$n^3 = (2R+1)^3 = 8R^3 + 12R^2 + 6R + 1 = 2(4R^3 + 6R^2 + 3R) + 1$$

$$\frac{n^3}{2} = \frac{8R^3 + 12R^2 + 6R + 1}{2} = 4R^3 + 6R^2 + 3R + \frac{1}{2}$$

OBVIOUSLY NOT EVEN

A, B, C, D are sets | $A \subseteq B$ and $C \subseteq D$ | A and C have no elements in common.

* ASSERTION
A and D also have no elements in common

$\boxed{FB_3}$

* COUNTEREXAMPLE

$A = \{\pi, 1, 2, 3\}$
$B = \{A, 4, 5, 6\}$
$C = \{4, 5, 6\}$
$D = \{C, \pi\}$

$A \subseteq B$ and $C \subseteq D$
A and C have no elements in common

BUT ASSERTION is NOT TRUE FOR THESE 4 SETS; THEREFORE, THE ASSERTION is WRONG.
(BOTH A AND D CONTAIN π)