5. Consider the function $f(x) = x^2 - 2x + 1$.
   a. Graph the function on Desmos. What do you the limit of the function is at $x = 3$?

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   b. Suppose $\varepsilon = 1$. Find $\delta > 0$ such that it satisfies the limit definition (that is, find the $\delta > 0$ such that if $|x - 3| < \delta$ then $|(x^2 - 2x + 1) - L| < \varepsilon$).

What the heck

$|x-1-3| \le 1$

$|x-3| \le 1$

$2 \le x \le 4$

$\delta = \min\{|x-3|, 1\}$

$|(x^2 - 2x + 1) - 4| < \varepsilon$

$|x^2 - 2x - 3| < \varepsilon$

$|(x-3)(x+1)| < \varepsilon$

$|x-3||x+1| < \varepsilon$

$|x-3| \le \frac{\varepsilon}{|x+1|}$

$\therefore |x-3| \le \frac{\varepsilon}{5}$

$\delta = \min\{1, \frac{\varepsilon}{5}\}$

$|x-3| \le 1$

$-1 \le x-3 \le 1$

$2 \le x \le 4$

$3 \le x+1 \le 5$

$3 \le |x+1| \le 5$

take the upper bound

why not lower?

$\boxed{\frac{1}{5}}$

   c. Suppose $\varepsilon = 0.5$. Find $\delta > 0$ such that it satisfies the limit definition (up to 4 decimal places).

$\underbrace{\delta = \min\{1, \frac{0.5}{5}\}} = \frac{0.5}{5} = \frac{1}{10}$

   d. Suppose $\varepsilon = 0.25$. Find $\delta > 0$ such that it satisfies the limit definition(up to 4 decimal places).

$\boxed{\frac{1}{20}}$