

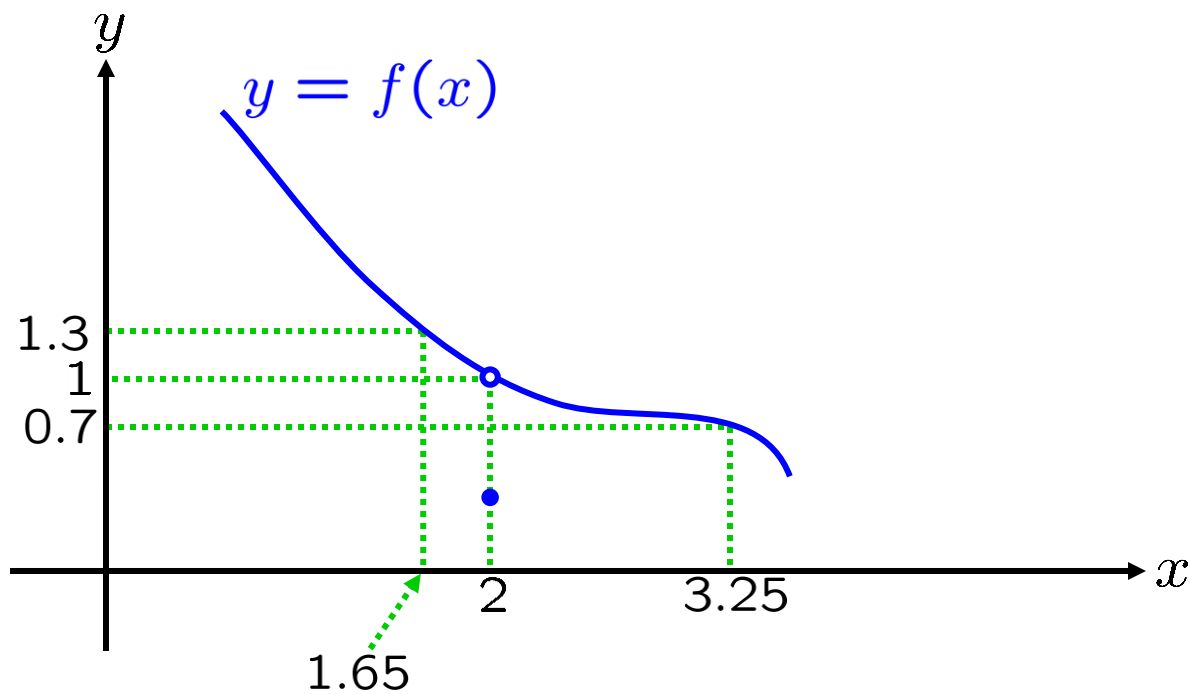
CALCULUS

The limit game and
the exact definition of a limit

OLD

0150-1. For the function f graphed below,
what is the largest number δ such that

$$0 < |x - 2| < \delta \Rightarrow |(f(x)) - 1| < 0.3 \quad ?$$



0150-2. Let $f(x) = 2x - 1$.

Show a graph of $y = f(x)$ that includes the points $(2, 3)$, $(3, 5)$ and $(4, 7)$.

Find the largest number δ such that

$$|x - 3| < \delta \Rightarrow |(f(x)) - 5| < 1.$$

0150-3. Let $g(x) = [2x - 1] \left[\frac{x - 3}{x - 3} \right]$.

Show a graph of $y = g(x)$ that includes the points $(2, 3)$ and $(4, 7)$.

Find the largest number δ such that

$$0 < |x - 3| < \delta \Rightarrow |(g(x)) - 5| < 1.$$

^{OLD}0150-4. In shop class, you are asked to build a square sheet of metal of area 100 square inches.

The area can be slightly off, but must be between 99 and 101 square inches.

Say you have access to a machine that will punch out a perfect square, and the side length (in inches) is controlled by a dial.

How close to 10 must you set the dial to get the area to be in the specified range?

Give your answer to five decimal places.

0150-5. Prove that $\lim_{x \rightarrow 3} 7x = 21$.
OLD

Your writeup should read:

Given $\varepsilon > 0$.

Let $\delta = \dots$.

Assume $0 < |x - 3| < \delta$.

Then $|7x - 21| < 7\delta$.

←-----penultimate sentence

Then $|7x - 21| < \varepsilon$.

←-----last sentence

All you need do is fill in the ellipsis (\dots) with a carefully chosen expression of ε .

Hint: The last sentence in the writeup clearly follows from the penultimate sentence if $7\delta = \varepsilon$.