

Lab worksheet for Tuesday, April 6, 2021
Practice: Puncture Law, Epsilon-Delta

Exercise 1: Compute the following limits:

a) $\lim_{h \rightarrow 0} \frac{(3+h)^2 - 9}{h}$

b) $\lim_{x \rightarrow 1} g(x)$ where $g(x) = \begin{cases} x + 1 & \text{if } x \neq 1 \\ \pi & \text{if } x = 1 \end{cases}$

c) $\lim_{x \rightarrow 1} \frac{x^3 - 1}{x^2 - 1}$

d) $\lim_{x \rightarrow -4} \frac{x^2 + 5x + 4}{x^2 + 3x - 4}$

e) $\lim_{x \rightarrow 7} \frac{\sqrt{x+2} - 3}{x - 7}$

Exercise 2:

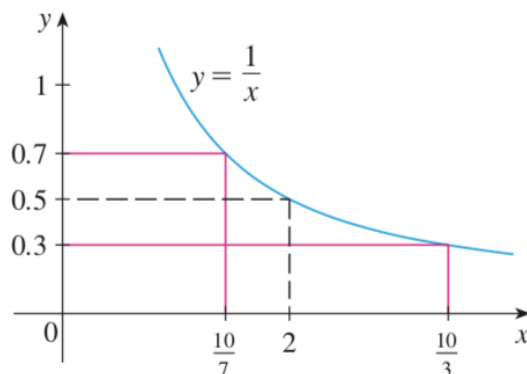
a) Find a number δ such that if $|x| < \delta$ and $x \neq 0$, then $\left| \frac{x^2 + 3x}{x} - 3 \right| < 0.001$

b) Find a number δ such that if $|x| < \delta$ and $x \neq 0$, then $\left| \frac{2x^3 + 6x}{x} - 6 \right| < 0.002$

Exercise 3:

a) Use the given graph of $f(x) = \frac{1}{x}$ to find a number δ such that

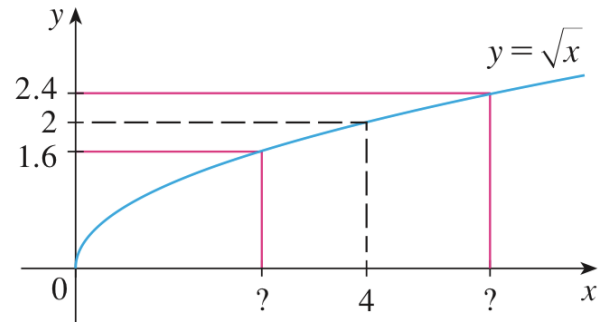
$$\text{if } |x - 2| < \delta \text{ then } \left| \frac{1}{x} - 0.5 \right| < 0.2$$



b) Use algebra to solve the problem in part a.

Exercise 4:

- a) Use the given graph of $f(x) = \sqrt{x}$ to find a number δ such that
if $|x - 4| < \delta$ then $|\sqrt{x} - 2| < 0.4$



- b) Use algebra to solve the problem in part a.