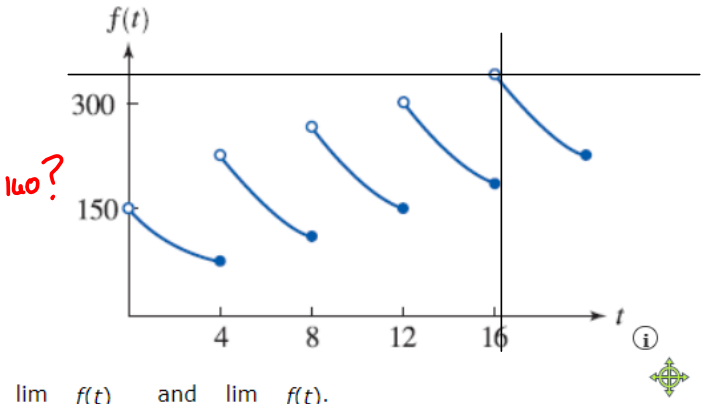
Section 1.4

Mainly just trying to motivate the limit stuff we're doing, later, by "making" you compute a bunch of average slopes, taking 2nd point closer and closer to the first, and attempting to GUESS the limit via "numerical investigation."

If you can grok the spreadsheet stuff, that can help you in the future.

↳ Stranger in a Strange Land.

A patient receives a 150 mg injection of a drug every 4 hours. The graph s
$t$ hours.



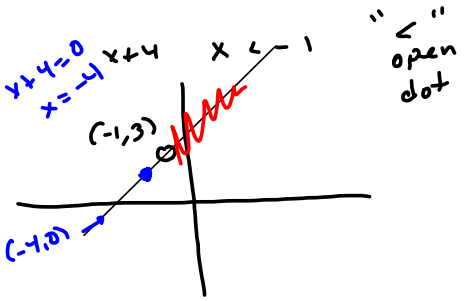

Find $\lim_{t \to 16^-} f(t)$ and $\lim_{t \to 16^+} f(t)$.

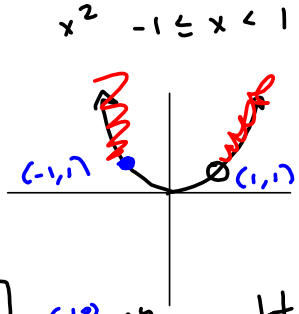
Graphing a Piecewise-Defined Function

Let $f(x) = \begin{cases} 4 + x & \text{if } x < -1 \\ x^2 & \text{if } -1 \le x < 1 \\ 2 - x & \text{if } x \ge 1 \end{cases}$.

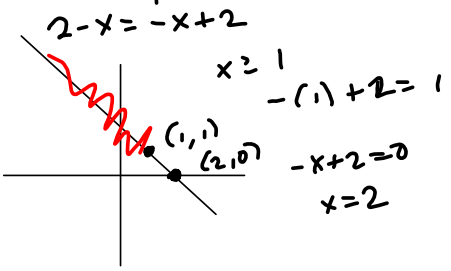
Sketch the graph of $f$.

3 graphs
Find values @ suture points
$x = -1, x = 1$ from both directions
COMBINE



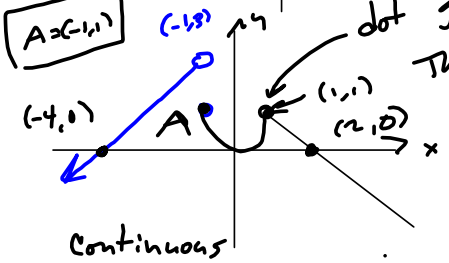




$-1 \le x$ solid dot
$(-1)^2 = 1$
$x < 1$ open
$(1)^2 = 1$
got filled!!
This usually doesn't happen.




$-(1)+2 = 1$
$-x+2=0$
$x=2$

A=(-1,1)




Continuous on $(-1, \infty)$
Jump Discontinuity @ $x = -1$.

Use the graph of the function $f$ to state the value of each limit, if it exists. (If an answer does not exist, enter DNE.)

$f(x) = \dfrac{4}{1 + 2^{1/x}}$

(a) $\lim_{x \to 0^-} f(x)$

4

(b) $\lim_{x \to 0^+} f(x)$

0

(c) $\lim_{x \to 0} f(x)$

DNE

Graphing Calculator/Desmos


$\dfrac{4}{1+2^{1/x}}$ $x \to 0^-$

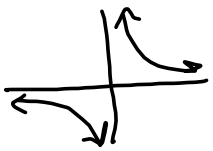
x is negative, so it's like

$\dfrac{4}{1+2^{-\text{num.}}} = \dfrac{4}{1+\frac{1}{2^{\text{num}}}} = \dfrac{4}{1+\frac{1}{2^{BIG}}} = \dfrac{4}{1+\frac{1}{HUGE}}$

$\dfrac{1}{x}$ $x \to 0^-$ BIG, NEG, so $\approx \dfrac{4}{1+0}$

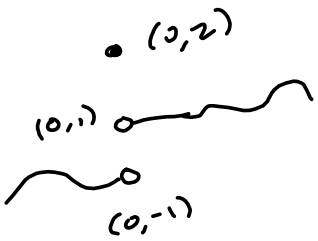
$\dfrac{4}{1+2^{\frac{1}{x}}}$ $x \to 0^+$ $\dfrac{4}{1+2^{BIG}} = \dfrac{4}{1+HUGE} = \dfrac{4}{HUGER} \approx 0$

$\dfrac{1}{x}$ $x \to 0^+$ BIG, POS.



Sketch the graph of a function $f$ that satisfies all of the given conditions.

$$\lim_{x \to 0^-} f(x) = -1, \quad \lim_{x \to 0^+} f(x) = 1, \quad f(0) = 2$$



Guess the value of the limit (if it exists) by evaluating the function at the given numbers.

$$\lim_{x \to 4} \frac{x^2 - 4x}{x^2 - 16}, \quad x = 4.1, 4.05, 4.01, 4.001, 4.0001, 3.9, 3.95, 3.99, 3.999, 3.9999$$

Complete the table (correct to six decimal places).

| $x$ | $f(x)$ | $x$ | $f(x)$ |
|---|---|---|---|
| 4.1 | | 3.9 | |
| 4.05 | | 3.95 | |
| 4.01 | | 3.99 | |
| 4.001 | | 3.999 | |
| 4.0001 | | 3.9999 | |

Let $Y_1 = (x^2 - 4x)/(x^2 - 16)$ & just plug in a bunch of x-values.

Using Table Feature on a TI-84

| X | Y1 |
|---|---|
| 4.1 | .50617 |
| 4.04 | .50249 |
| 4.04 | .50249 |
| 4.05 | .50311 |
| 4.01 | .50062 |
| 4.001 | .50006 |
| 4.0001 | .50001 |

X=4.0001

Using "VARS" key on TI-84.

```
                    Error
Y1(4.1
       .5061728395
Y1(4.05
       .5031055901
Y1(4.01)
       .5006242197
```

The Y= window.

```
 Plot1 Plot2 Plot3
\Y1■(X^2-4X)/(X^
2-16)
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
```