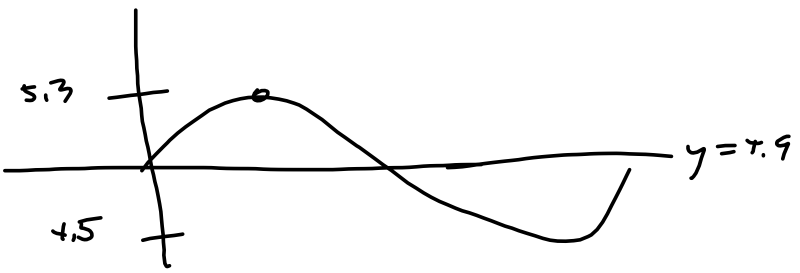
§1.3 #12 T = period = 4.5 days

$4 + \frac{1}{2} = \frac{9}{2}$ days

$a = .4$

midline = $y = 4.9$ = $t=0$ height



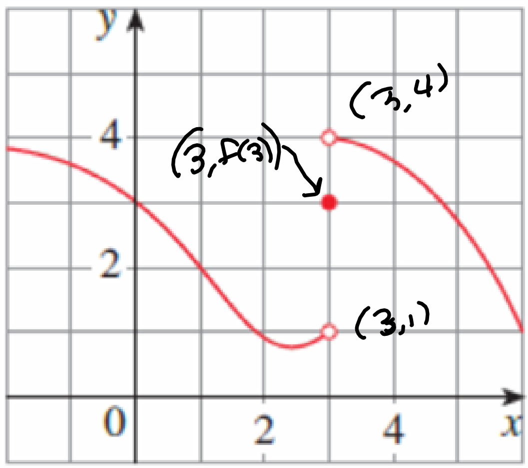
Want $bt = 2\pi$ when $t = 4.5$

$\boxed{4.5b = 2\pi}$ from $T=4.5$ to find

$b = \frac{2\pi}{4.5} = \frac{2\pi}{\left(\frac{9}{2}\right)} = \frac{4\pi}{9}$

$.4\sin\left(\frac{4\pi}{9}t\right) + 12 =$

or $.4\sin\left(\frac{2\pi}{4.5}t\right) + 12$



$\lim_{x \to 3^-} f(x) = 1$

$\lim_{x \to 3^+} f(x) = 4$

$f(3) = 3$

More §1.5

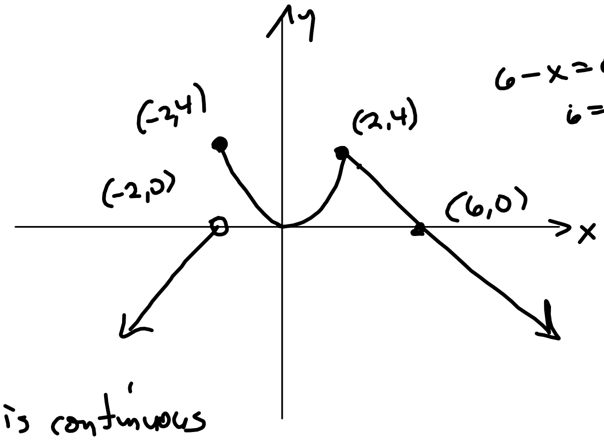
$$\text{Let } f(x) = \begin{cases} 2 + x & \text{if } x < -2 \\ x^2 & \text{if } -2 \le x < 2. \\ 6 - x & \text{if } x \ge 2 \end{cases}$$

$2+(-2)=0 \rightsquigarrow (-2,0)$ o.

$(-2)^2 = 4 \rightsquigarrow (-2,4)$ •

$(2)^2 = 4$

$6-2=4$



$6-x=0$

$6=x$

$\lim\limits_{x\to -2^-} f(x) = 0$

$\lim\limits_{x\to -2^+} f(x) = 4$

$\lim\limits_{x\to -2} f(x) \;\nexists$

f is continuous on $(-\infty,-2)\cup(2,\infty)$

$\left.\begin{aligned}\lim\limits_{x\to 2^-} f(x) &= 4 \\ \lim\limits_{x\to 2^+} f(x) &= 4\end{aligned}\right\} \lim\limits_{x\to 2} f(x) = 4$

Furthermore, f is cont's @ $x=2$

b/c $\lim\limits_{x\to 2} f(x) = 4 = f(x)$

§1.5 #18 is the topologist's sine curve that oscillates infinitely many times in any neighborhood of $x=0$

§1.5 # 19 Lorentz Transformation.

$$m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} \xrightarrow{v \to c} \infty$$

m_0 = initial mass

$\sqrt{1-1}$

§1.6 Limit Laws:

Mostly we want to just plug in

$\lim_{x\to 3} x^2 = 3^2 = 9$, which we can do, whenever the function is nice & cnt^s @ the limiting value, in this case, $a = 3$. But what about

$$\lim_{x\to -2} \frac{x^2+3x+2}{x^2-4}$$

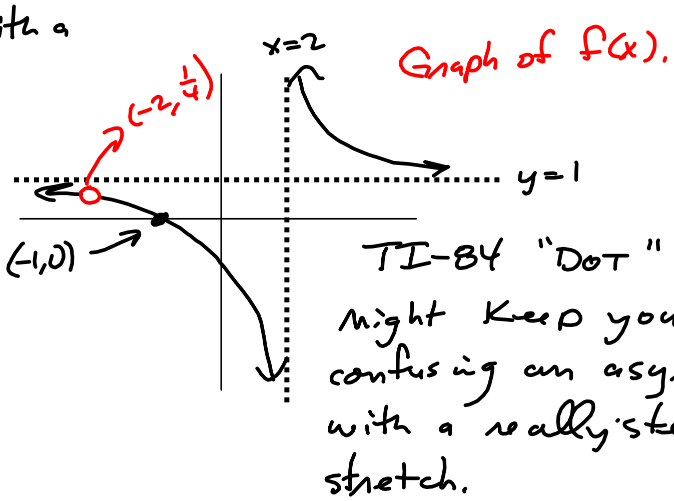
Let $f(x) = \dfrac{x^2+3x+2}{x^2-4}$. Then $f(-2)$ $\nexists$!

But $\lim_{x\to -2} f(x)$ $\exists$!!! what is it?

$$\frac{x^2+3x+2}{x^2-4} = \frac{\cancel{(x+2)}(x+1)}{\cancel{(x+2)}(x-2)} = \frac{x+1}{x-2} \xrightarrow{x\to -2} \frac{-2+1}{-2-2} = \frac{-1}{-4} = \frac{1}{4}$$

$x \neq -2$

$f(x)$ is $\dfrac{x+1}{x-2}$ with a hole @ $(-2, \frac{1}{4})$



TI-84 "DOT" MODE might keep you from confusing an asymptote with a really steep stretch.

Limit Laws   Assume $\lim_{x\to c} f(x) = L$ & $\lim_{x\to c} g(x) = K$.

We'll abbreviate to $\lim f$ & $\lim g$ for brevity

$$\lim f \pm \lim g = L \pm K \quad \& \quad \lim (f \pm g) = \lim f \pm \lim g$$

If $d \in \mathbb{R}$ then $\lim_{x\to c} (df) = d \lim f$

$$\lim (fg) = (\lim f)(\lim g)$$

$$\lim \left(\frac{f}{g}\right) = \frac{\lim f}{\lim g}, \text{ provided } \lim g \neq 0.$$

$$\lim (f^n) = (\lim f)^n$$

See this a lot: Limits are "Linear"

$$\lim (af + bg) = a \lim f + b \lim g$$

Differentiation & Integration are
" "Linear" Operators"

4. 0/1 points

Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exis

$$\lim_{t \to 2} \frac{t^4 - 1}{2t^2 - 3t + 7} = \frac{15}{9}$$

$2(2)^2 - 3(2) + 7 = 9$

$2^4 - 1 = 15$

They want to "see" the formalities.

$$= \frac{\lim_{t \to 2} (t^4 - 1)}{\lim_{t \to 2} (2t^2 - 3t + 7)} \quad \frac{\lim_{t \to 2} (t)^4 - \lim_{t \to 2} (1)}{\lim_{t \to 2} (2t^2) - \lim_{t \to 2} (3t) + \lim_{t \to 2} (7)}$$

$$= \frac{\left(\lim_{t \to 2} (t)\right)^4 - 1}{2 \lim_{t \to 2} (t^2) - 3 \lim (t) + 7} = \frac{2^4 - 1}{2\left(\lim_{t \to 2} (t)\right)^2 - 3(2) + 7}$$

Diagnostic tests:

https://harryzaims.com/201/201-fall-19/diagnostic-tests/diagnostic-tests.html