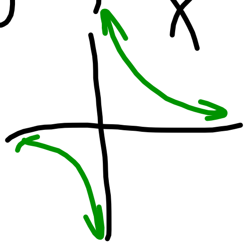
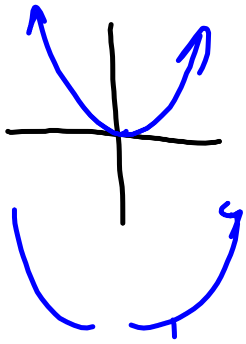
Continuous functions

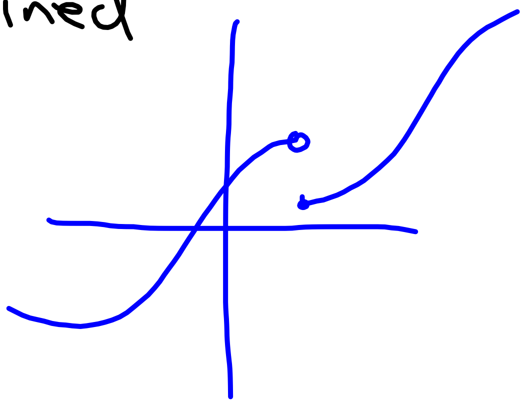
*Defined

$f(x) = x^2$

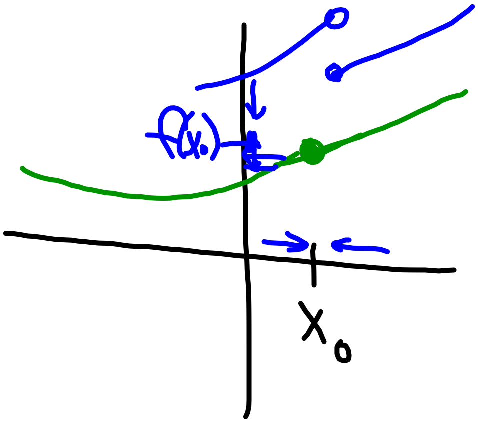
$g(x) = \frac{1}{x}$







Continuous at x_0

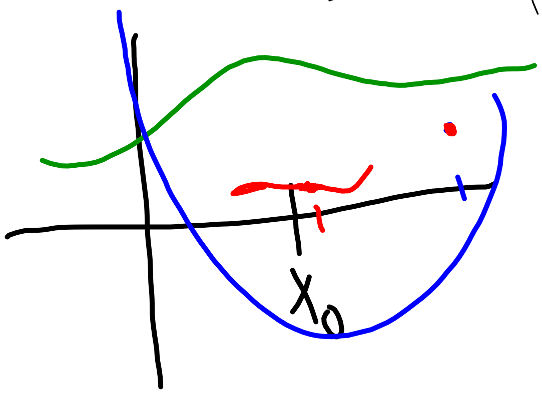


$* f(x_0)$ has to exist

As $|x - x_0| \to 0$

$|f(x) - f(x_0)| \to 0$

Given $\varepsilon > 0$, there exists a $\delta > 0$ such that if $|x - x_0| < \delta$, then $|f(x) - f(x_0)| < \varepsilon$



there is a $\delta_1 > 0$ such that

f, g both are continous at x_0. What about $f+g$? same for g, δ_2 $|f(x) - f(x_0)| < \frac{\varepsilon}{2}$ if $|x - x_0| < \delta_1$

$\frac{\varepsilon}{2}$, $\frac{\varepsilon}{2}$

Given an $\boxed{\varepsilon > 0}$ need to show there is a $\delta > 0$ so that if $|x - x_0| < \delta$, then $|(f+g)(x) - (f+g)(x_0)| < \varepsilon$.

$$\left|(f+g)(x)-(f+g)(x_0)\right| = \left|f(x)+g(x)-f(x_0)-g(x_0)\right|$$

$$= \left|f(x)-f(x_0)+g(x)-g(x_0)\right|$$

$|a+b| \le |a|+|b|$

$$\le \underbrace{\left|f(x)-f(x_0)\right|}_{<\frac{\varepsilon}{2}} + \underbrace{\left|g(x)-g(x_0)\right|}_{<\frac{\varepsilon}{2}}$$

$$\le \frac{\varepsilon}{2}+\frac{\varepsilon}{2} \quad \text{if } |x-x_0| < \min\{\delta_1,\delta_2\}$$

$$= \varepsilon$$

$\mathcal{C}$ is the functions defined and continuous "on" $\mathbb{R}$

$\mathcal{C}[a,b]$

$\mathcal{C}^1[a,b]$ is the subspace of $\mathcal{F}[a,b]$ consisting of functions with continuous first derivative on $[a,b]$.

Section 1.1: 1-3

$g(x) = \frac{1}{x^2-x-2} \in \mathcal{I}$? No

$(x-2)(x+1)$ $\in \mathcal{R}[-1,2]$? No

$[0,1]$ Yes

$\mathcal{B}$ $[\vec{v}]_{\mathcal{B}}$ Section 1.6: 1

Due Wednesday

$\mathcal{E}$ $[v]_e$

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 \\ 7 \end{bmatrix} = \begin{bmatrix} (1)(3)+(2)(7) \\ (3)(3)+(4)(7) \end{bmatrix} = \begin{bmatrix} 17 \\ 37 \end{bmatrix}$$

$$c_1\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}+c_2\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}+c_3\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}=\begin{bmatrix}0 & 1\\ 3 & 4\end{bmatrix}$$

$$\begin{bmatrix}c_1 & 2c_1\\ 3c & 4c_1\end{bmatrix}+ \text{"} \quad \text{"} \quad =$$

$c_1+c_2+c_3=0$

$=1$

$=3$

$=6$

$$\begin{bmatrix}c_1+c_2+c_3 & \\ & \end{bmatrix}=\begin{bmatrix}0 & 1\\ 3 & 6\end{bmatrix}$$

$c_1(1+x+x^2)+c_2$

$(\quad)+(\quad)x+(\quad)x^2=7x^2+5x-1$