$f(x) = x^{2/3}(x+2) = x^{\frac{5}{3}} + 2x^{\frac{2}{3}}$

x-int: $(0,0)$, $(-2,0)$

$\frac{x^{4/3}}{x^{1/3}}$

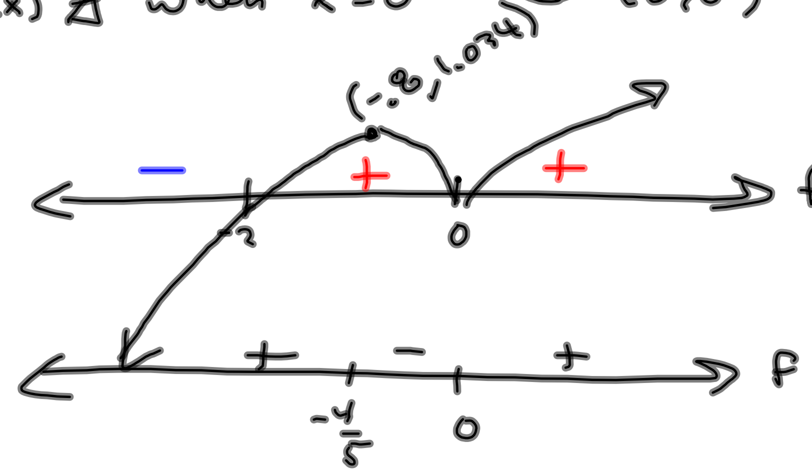
```
                 0
ln(10
       2.302585093
√(98
       9.899494937
Y1(-4/5)
       1.034128651
```

$f'(x) = \frac{5}{3}x^{\frac{2}{3}} + \frac{4}{3}x^{-\frac{1}{3}}$

$= \frac{5x+4}{3x^{1/3}}$ SET $= 0 \Longrightarrow x = -\frac{4}{5}$

$f(-\frac{4}{5}) \approx 1.03413 \longrightarrow (-\frac{4}{3}, 1.03413)$

$f'(x) \nexists$ when $x=0 \longrightarrow (0,0)$



$x^{2/3}\underline{(x+2)}$

$5(x+4/5)^1$

$\frac{5x+4}{3x^{1/3}}$

Tues §4.1 I #s 1-4, 7, 10-14, 17, 18, 21, 24, 27, 28

Wed §4.1 II #s 37, 38, 43, 46, 51, 58, 59, 67 a-c, 68,
71, 72

Thurs §4.2 #s 1, 4, 7, 10, 11, 13*, 14, 18 19, 24, 27,
31, 34, 37, 42, 46

#s 49-58 §4.1 Abs & local extremes

55 $\dfrac{1}{\sqrt[3]{1-x^2}} = (1-x^2)^{-\frac{1}{3}} = f(x) = \dfrac{1}{((1-x)(1+x))^{1/3}}$

$f'(x) = -\frac{1}{3}(1-x^2)^{-4/3}(-2x) = \dfrac{2x}{3(1-x^2)^{4/3}}$

$= \dfrac{2x}{3((1-x)(1+x))^{4/3}}$ SET $= 0 \rightarrow \boxed{x=0}$

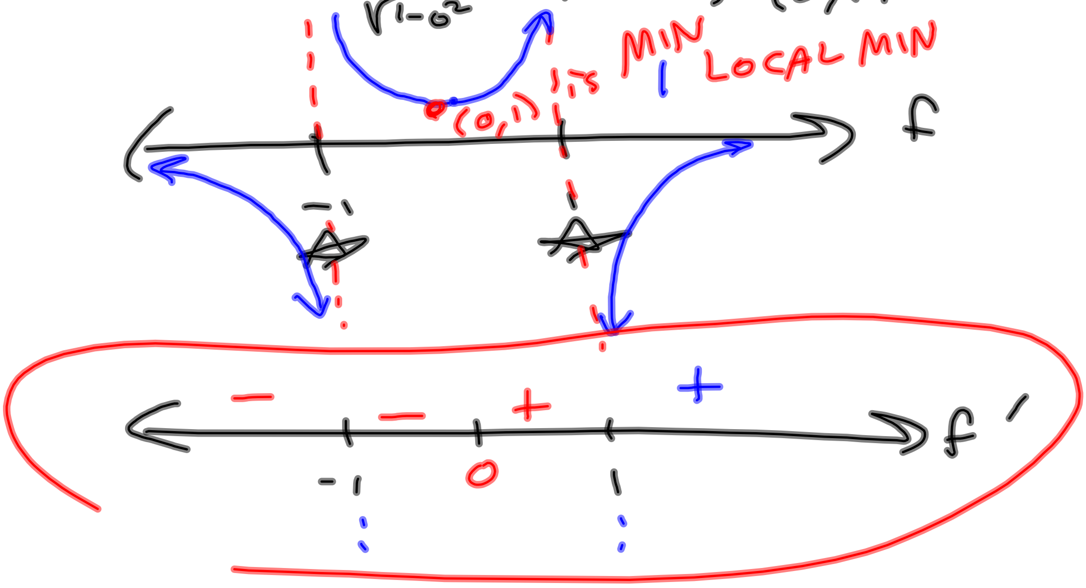
$\boxed{f'(x) \nexists \text{ when } x = \pm 1} \rightarrow$ Not in Domain

$x = \pm 1$ are boundary values for f.

$\mathcal{D} = \mathbb{R} \setminus \{\pm 1\}$

CPs: $x=0$ is onliest one

$f(0) = \dfrac{1}{\sqrt[3]{1-0^2}} = 1 \rightsquigarrow (0,1)$ max/min?



$f(x) = x^{2/3}$

$f'(x) = \frac{2}{3} x^{-\frac{1}{3}}$ $\frac{2}{3\sqrt[3]{x}}$

CP's: $x = 0$

§4.2 MVT

Mean Value Theorem

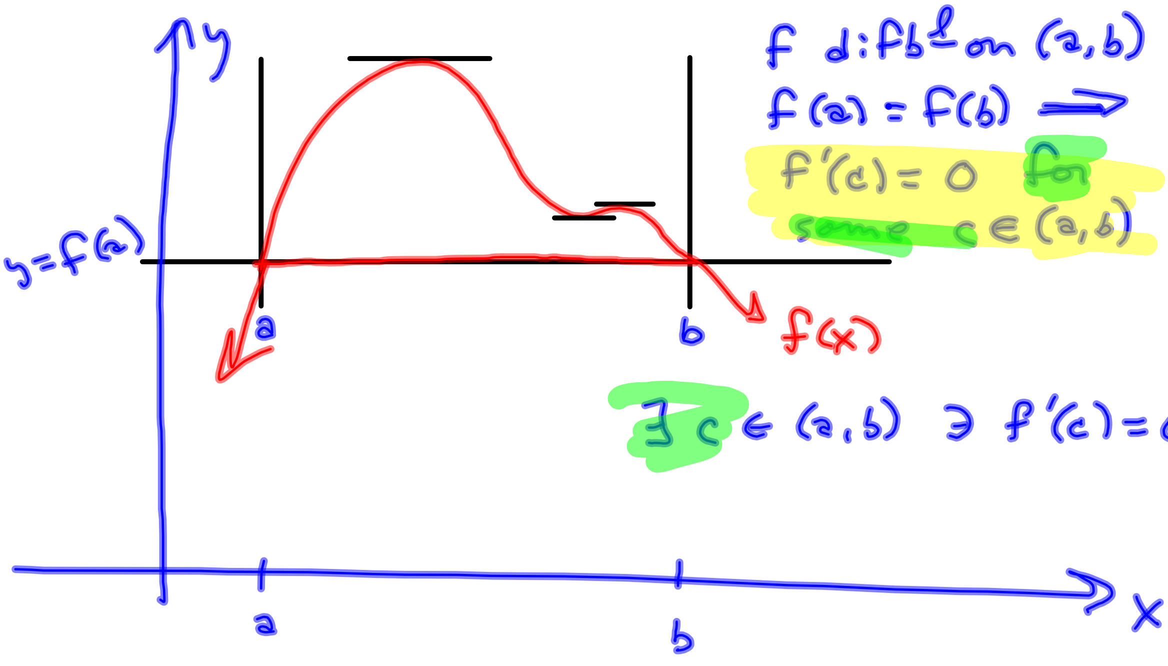
Rolle's Theorem

f cnt^s on $[a,b]$

f dif'b^l on (a,b)

$f(a)=f(b) \Longrightarrow$

$f'(c)=0$ for some $c\in(a,b)$



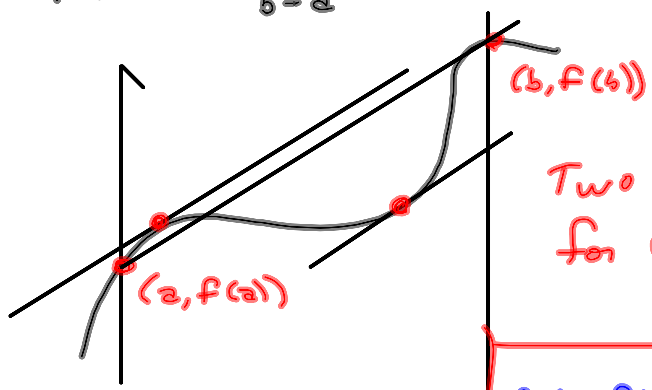
$\exists\, c\in(a,b) \ni f'(c)=0.$

MVT $\quad f$ cnt^{s} on $[a, b]$

$\quad f$ difb^{l} on (a, b)

Then $\exists\, c \in (a, b) \ni f'(c) = \dfrac{f(b) - f(a)}{b - a}$

i.e. $f'(c) = \dfrac{f(b) - f(a)}{b - a}$ for some $c \in (a, b)$



Two possibles for c, here.

Proof: Define $g(x) = f(a) + \boxed{\dfrac{f(b) - f(a)}{b - a}(x - a)}$

$g'(x) = \dfrac{f(b) - f(a)}{b - a}$

and $h(x) = f(x) - g(x)$.

Then $h(a) = f(a) - \left[f(a) + \dfrac{f(b) - f(a)}{b - a}(a - a)\right]$

$= 0$

$h(b) = f(b) - \left[f(a) + \dfrac{f(b) - f(a)}{\cancel{b - a}}(\cancel{b - a})\right]$

$= f(b) - f(a) - f(b) + f(a)$

$= 0$

So $h(x)$ satisfies Rolle's. So

$\exists\, c \in (a, b) \ni h'(c) = 0$

$h'(c) = 0 = f'(c) - g'(c)$

$= f'(c) - \dfrac{f(b) - f(a)}{b - a} = 0$

$\Rightarrow f'(c) = \dfrac{f(b) - f(a)}{b - a}$ $\blacksquare$