34. $y = \sec x \quad \left[\frac{-\pi}{6}, \frac{\pi}{3}\right]$

$y' = \sec x \tan x$

$f(-\pi/6) \rightarrow \sec(-\pi/6) = +\sqrt{3}/2 = 2/\sqrt{3}$

$f(0) \rightarrow \quad = 1$

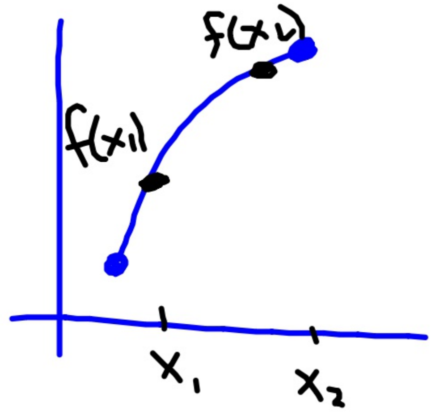
$f(\pi/3) \rightarrow \sec(\pi/3) = 1/2 = 2$

3.3 1st Derivative

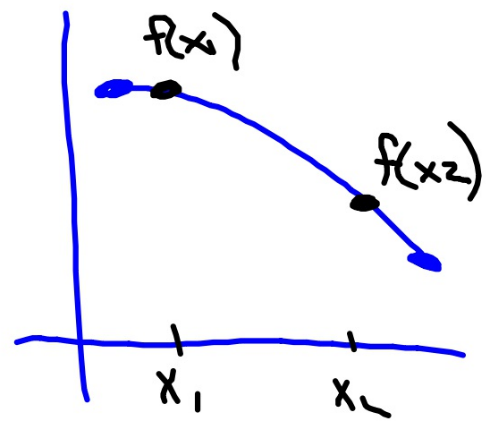
A. A function f is said to be:

1. increasing for $x_1 < x_2$
   $f(x_1) < f(x_2)$
2. decreasing for $x_1 < x_2$
   $f(x_1) > f(x_2)$

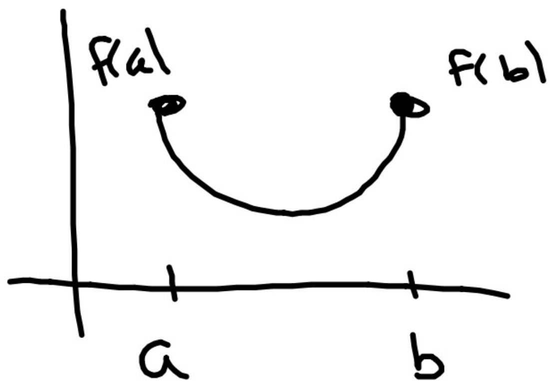
1.

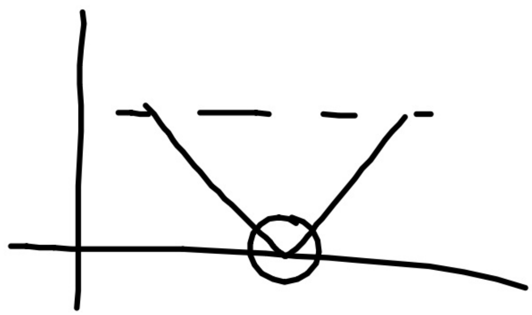


2.



3. <u>Rolle's Theorem</u> - if f is cont. on $[a,b]$, and differentiable on (a,b) if at some point $f(a)=f(b)$, then $\exists$ a c $\therefore$ $f'(c)=0$.


f(a)
f(b)
a
b



B. Find Intervals of Increasing & decreasing → 1st derivative test

1. Find the CV
2. Evaluate $f'(x)$ BETWEEN the CV
3. ATQ

Ex. Find the intervals of Inc/Dec
for $f(x) = x^3 - \frac{3}{2}x^2$

$0 = 3x^2 - 3x$ $\quad$ $0 \; , \; 1$

$0 = 3x(x - 1)$

$3x = 0$ $\quad$ $x - 1 = 0$

$+ \qquad - \qquad +$

$f'(-1) \quad 0 \quad f'(.5) \quad 1 \quad f'(2)$

$3(.5)^2 - 3(.5)$

$.75 - 1.5$

INC: $(-\infty, 0) \cup (1, +\infty)$

DEC: $(0, 1)$

Ex. Find Inc/Dec for $f(x) = 27x - x^3$

$$0 = 27 - 3x^2$$

$$0 = \underline{3}(9 - x^2)$$

$$0 = 9 - x^2$$

$$x^2 = 9$$

$$x = \pm 3$$

$-$ $\quad$ $+$ $\quad$ $-$

$f'(-4)$ $\quad -3 \quad$ $f'(0)$ $\quad 3 \quad$ $f'(4)$

Inc: $(-3, 3)$

Dec: $(-\infty, -3) \cup (3, +\infty)$

Ex. Find Inc/Dec for $f(x)=(x^2-4)^{2/3}$

$u=x^2-4 \qquad y=u^{2/3}$

$du=2x \qquad dy=\frac{2}{3}u^{-1/3}$

$2x\left(\frac{2}{3}(x^2-4)^{-1/3}\right)$

$$\frac{4x}{3(x^2-4)^{1/3}}$$

$4x=0$

$x=0$

$x=\pm 2$

$$\begin{array}{ccccccc} - & & + & & - & & + \\ f'(-3) & -2 & f'(-1) & 0 & f'(1) & 2 & f'(3) \end{array}$$

Inc: $(-2,0)\cup(2,+\infty)$

Dec: $(-\infty,-2)\cup(0,2)$

$\frac{4(3)}{9-4}=\frac{+}{+}$ $\qquad \frac{4(-3)}{((-3)^2-4)}=\frac{-}{+}$

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