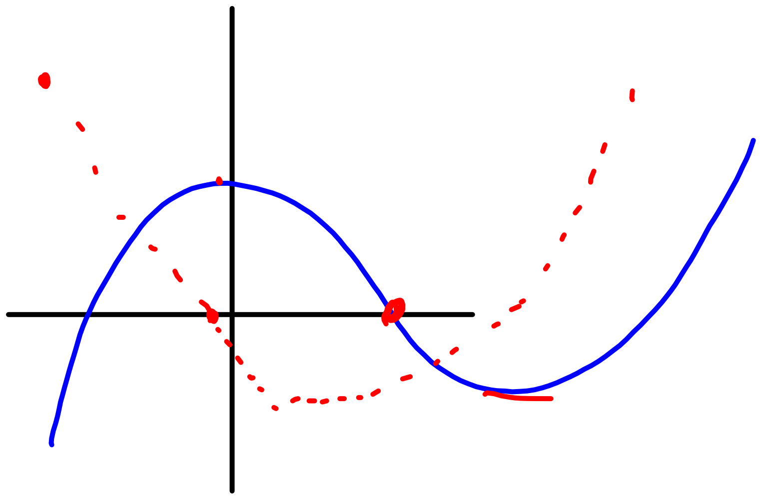


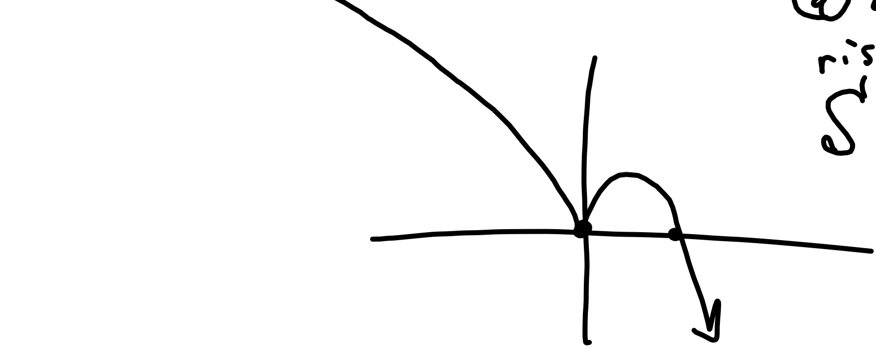
3.3 & 3.4 Videos up

$-x^{2/3} - x^5 = -x^{2/3}\left(1 - x^{13/3}\right)$ SET $= 0$

$x=0$ or $x=1$

Proceed @ own risk

§3.3



$$\lim_{x\to 2} x^2-5x = -6$$

Scratch

$|x^2-5x-(-6)|$

$= |x^2-5x+6|$

$= |x-2|\,\boxed{|x-3|}$

$<\delta$

Need upper bound on this.

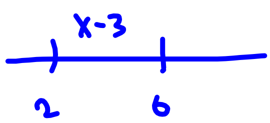
Assume $\delta \le 1$

$1 < x < 3$ (from $\lim_{x\to 2}$ ...)

$1-3 < x-3 < 0$

$-2 < x-3 < 0$

$\Rightarrow |x-3| < 2$



Let $\delta = \min\{1, \frac{\varepsilon}{2}\}$

Proof

Let $\varepsilon > 0$. Define $\delta = \min\{1, \frac{\varepsilon}{2}\}$. Then

$0 < |x-2| < \delta \Rightarrow$

$|x^2-5x-(-6)|$

$= |x^2-5x+6| = |x-3||x-2|$

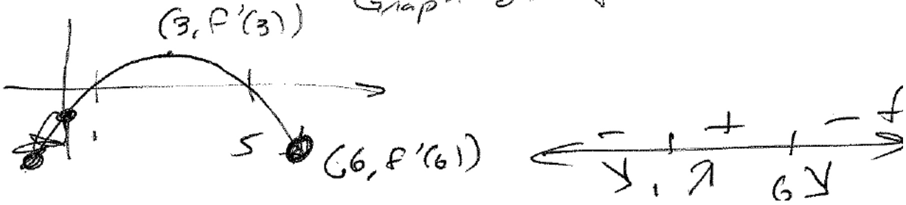
$< 2\delta \le 2\cdot\frac{\varepsilon}{2} = \varepsilon$ ∎

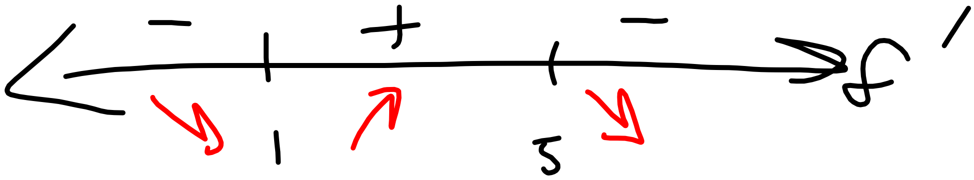
(5) f' is shown

(a) where is f inc? dec?

(b) where are the local extremes?

Graph of f'





f inc : $(1,5)$

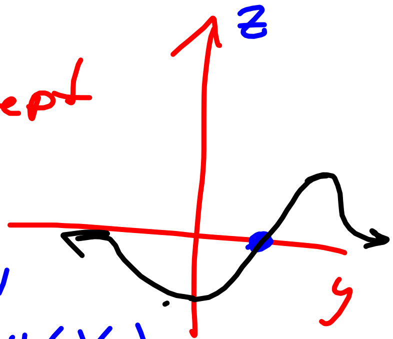
f dec : $(-\infty,1)\cup(5,\infty)$

local min : $(1, f(1))$

local max : $(5, f(5))$

§3.1 #8 (#13 in book)

$z = g(y) = \dfrac{y-1}{y^2-y+1}$ $y=1$ is intercept



$y^2-y+1=0$

$y^2-y = -1$

$y^2-y+\left(\frac{1}{2}\right)^2 = -1+\frac{1}{4}$

$\left(y-\frac{1}{2}\right)^2 = -\frac{3}{4}$ No real solutions

$a=1,\ b=-1,\ c=1$

$b^2-4ac = (-1)^2-4(1)(1)$

$= 1-4 = -3$

$\sqrt{-3}$

$$g'(y) = \frac{1(y^2-y+1)-(y-1)(2y-1)}{(y^2-y+1)^2}$$

$$= \frac{y^2-y+1-(2y^2-3y+1)}{(\quad)^2}$$

$$= \frac{y^2-y+1-2y^2+3y-1}{(\quad)^2}$$

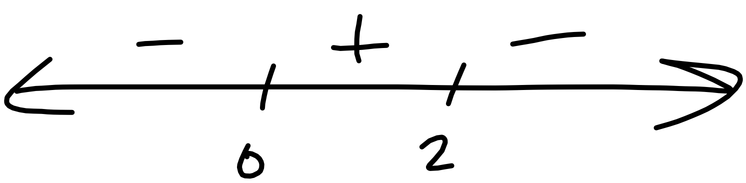
$$= \frac{-y^2+2y}{(\quad)^2} = \frac{-y(y-2)}{(\quad)^2}$$

$(\quad)^2 \neq 0$, by above work.

$-y(y-2)=0 \Rightarrow$

$\boxed{y=0 \text{ or } y=2}$ STOP!

$-y^2+2y$



§3.2 #

Show $(x+1)^{\frac{1}{2}} < 1 + \frac{1}{2}x$ if $x > 0$

① Establish it at one $x > 0$

$(x+1)^{\frac{1}{2}} < 1 + \frac{1}{2}x$ iff

$f(x) = (x+1)^{\frac{1}{2}} - 1 - \frac{1}{2}x < 0$

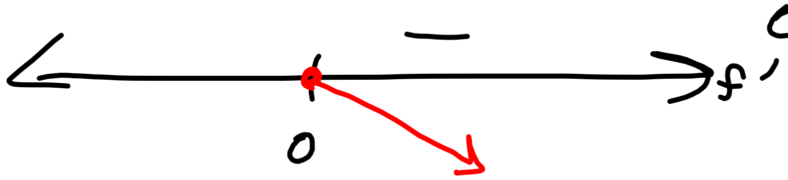
$x = 0$: $1^{\frac{1}{2}} - 1 - \frac{1}{2}(0) = 0$

$f'(x) = \underbrace{\frac{1}{2}(x+1)^{-\frac{1}{2}} - \frac{1}{2}}_{\frac{1}{2\sqrt{x+1}} - \frac{1}{2}\cdot\frac{\sqrt{x+1}}{\sqrt{x+1}}} = \frac{1 - (x+1)^{\frac{1}{2}}}{2(x+1)^{\frac{1}{2}}}$ SET $= 0$

$1 = (x+1)^{\frac{1}{2}}$

$1 = x + 1$

$0 = x$



So $\sqrt{x+1} = 1 + \frac{1}{2}x$ @ $x = 0$ $\Longleftrightarrow$

$f(x) = \sqrt{x+1} - 1 - \frac{1}{2}x = 0$ @ $x = 0$

and $f'(x) < 0$ everywhere $x > 0$.

$$f(x) < g(x) \iff$$

$$\boxed{h(x) = f(x) - g(x) < 0}$$

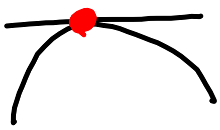
We showed $h(0) = f(0) - g(0) = 0$

$$h'(x) = f'(x) - g'(x) < 0 \quad \forall\, x > 0$$

$\cancel{h(x) = 0}$ &

$h(0) = 0$ &

$h'(x) < 0$ when $x > 0$



$\Longrightarrow h(x) < 0$