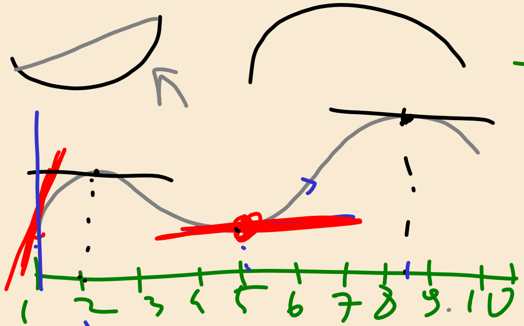
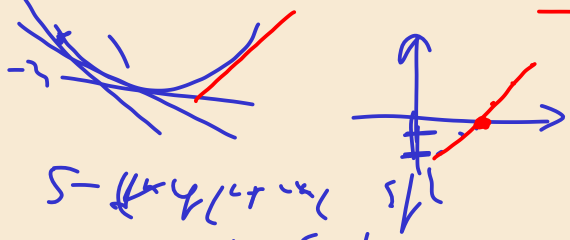
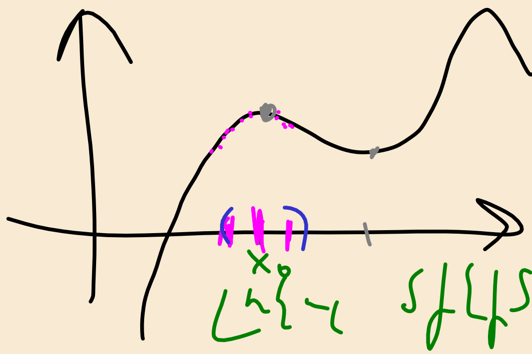


$f'(x)=0$

$\nexists f'(x)$

$f'(x)=5$





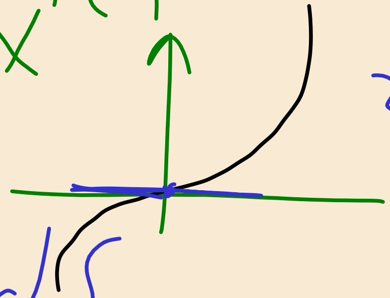
x_0

$\exists \delta>0$ s.t. $|x-x_0|<\delta$

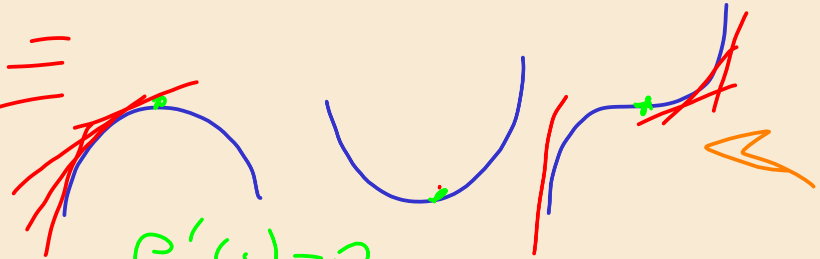
$f(x) \geq f(x_0)$

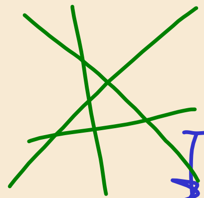
x_0

$\forall x \quad f(x) \geq f(x_0)$

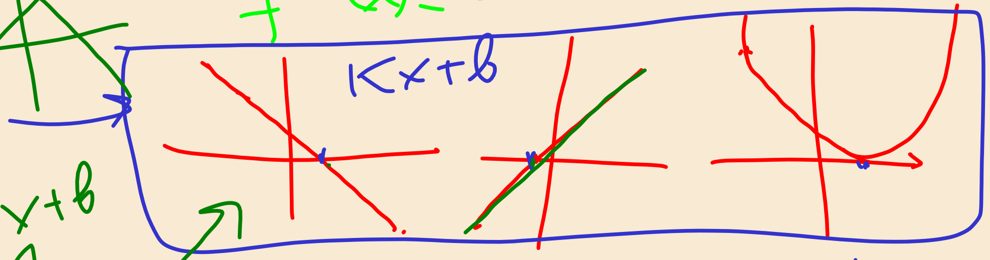


$3x^2 \to 0$





$f'(x)=0$



$kx+b$

$3x+b$

$x=1$

$x=2$

$f''<0$ $\quad$ $f''>0$ $\quad$ $f''=0$

$f'(x)=0$

$f''(x)<0 \Rightarrow x$ local max

$f''(x)>0 \Rightarrow x \rightarrow$ min

$x^4-4x^3+4x^2$

$f'(x)=4x^3-12x^2+8x$

$f'(x)=0$ $\exists$

x^2+4x

$x(x+4)$

$x=0$

$4(x^3-3x^2+2x)$

$4x(x^2-3x+2)=0$

$4x(x-1)(x-2)=0$

$x=0,\ 1,\ 2$

$A\cdot B\cdot C=0$

$A=0$

$4,\ 1$

$x_1 x_2=2$

$x_1+x_2=3$

$2,\ 1$

$1\cdot x^2-3x+2=0$

$D=9-4\cdot 2=1$

$ax^2+bx+c=0$

$D=b^2-4ac$

$(x-1)(x-2)=$

$=x^2-2x-x+2=$

$=x^2-3x+2$

$=x^2$

$x_1=\dfrac{-b+\sqrt{D}}{2a}$

$x_2=\dfrac{-b-\sqrt{D}}{2a}$

$x_1=\dfrac{3+1}{2\cdot 1}=\frac{4}{2}=2$

$x_2=\dfrac{3-1}{2}=1$

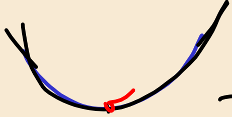
$1^2-3\cdot 1+2=0$

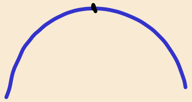
$2^2-3\cdot 2+2=0$

$a=1$

$x_1 x_2=c$

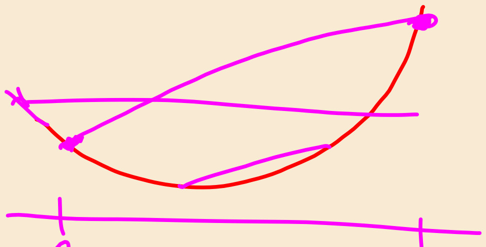
$x_1+x_2=-b$

$f''>0$  konvex, mert

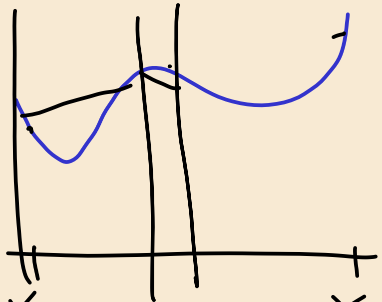
$f''<0$  konkáv

$-f$

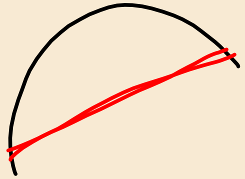
$f(\underline{x+(y-x)t})\;;\;t\in[0,1]$

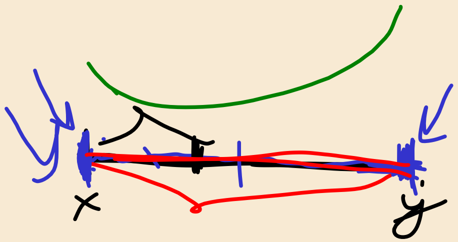


$\forall a,b \qquad b$



$x_1 \qquad x_2$





$t=1$

$\boxed{x+y-x=y}$

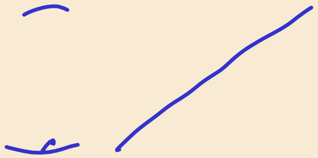
$x+0$

$\frac{x+y}{2}$

$x+\frac{y-x}{2}=\frac{2x+y-x}{2}=\frac{x+y}{2}$

f konvex, ha $\forall x,y \quad \forall\lambda\in[0,1]$

$$\boxed{f(\lambda x+(1-\lambda)y)\le\lambda f(x)+(1-\lambda)f(y)}$$



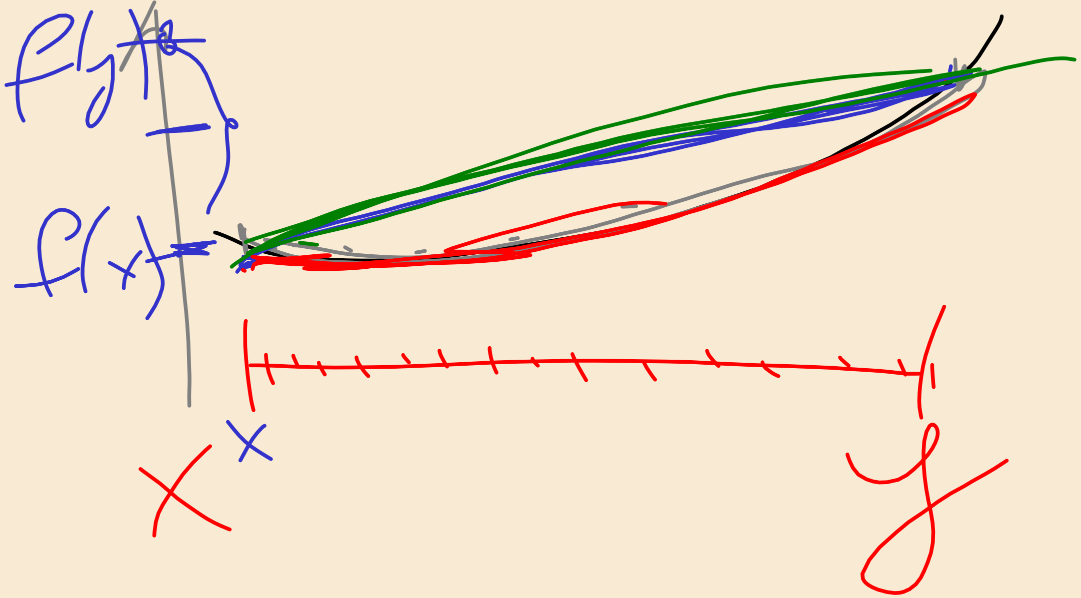
$$f(x+(y-x)t)\le f(x)+(f(y)-f(x))t$$

$$x+ty-tx=x(1-t)+y\,t \;\Big|\; \lambda x \quad (1-\lambda)y$$

$t=1-\lambda$

$\lambda=1 \quad \lambda=0$

y



$$\boxed{x+(y-x)t}$$

t

$$f(x)+(f(y)-f(x))t$$

$$f(\overbrace{\underbrace{x+(y-x)t}}) \le f(x)+(f(y)-f(x))t$$

$= 4x^3 - 12x^2 + 8x$

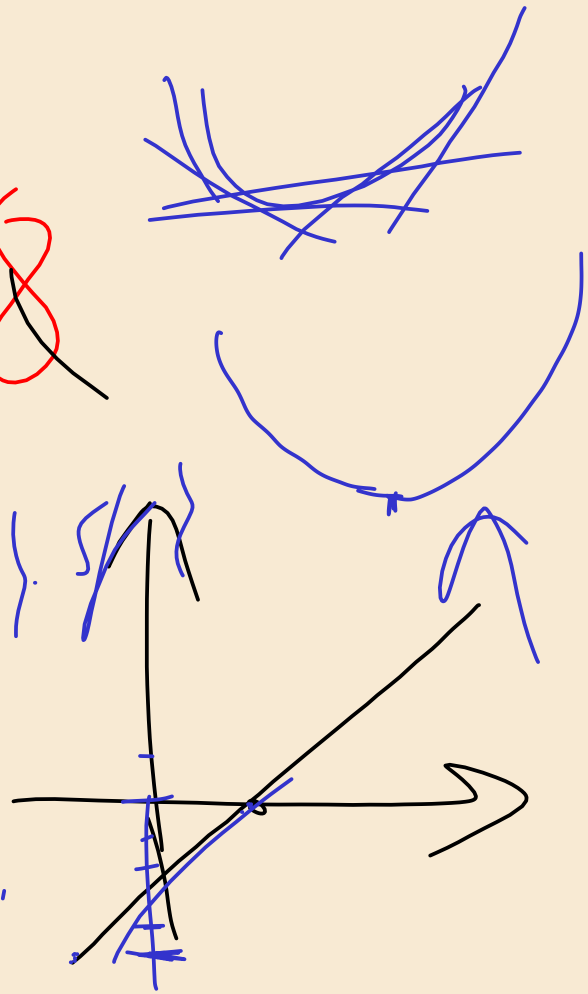
$f'' \quad 12x^2 - 24x + 8$

0, 1, 2

$0 \to 8$ $\quad x = 0 - 4$

$1 \to -4$

$2 \to 8$



1. [illegible] f'
2. [illegible] + [illegible]
3. [illegible] f''
4. [illegible] f'', [illegible]

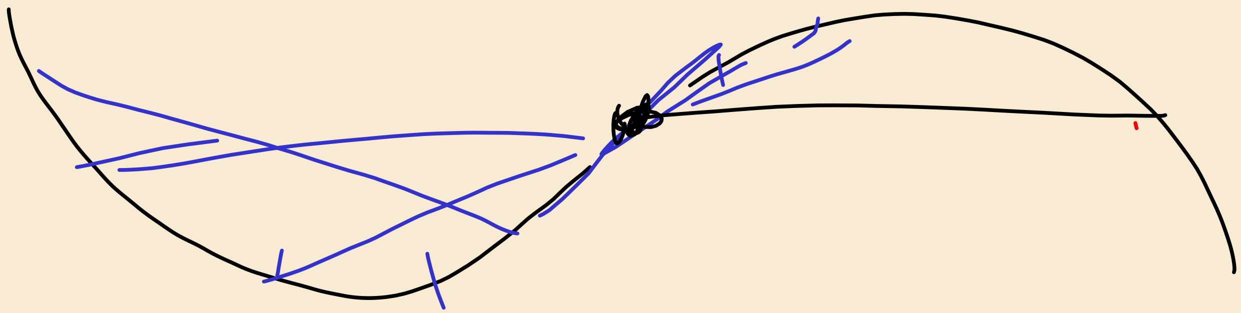
f - convex

g - convex

$\Rightarrow f + g$ - convex

$\boxed{\begin{matrix} w_1 f + w_2 g \\ w_1, w_2 > 0 \end{matrix}}$

$\boxed{g \text{ - convex} \quad g \circ f \quad g(f(x))}$



inflection point

$f'' > 0$

$f'' < 0$

$x^3 - 3x + 1$

$ax^2 + bx + c$

$a = 3$

$b = 0$

$c = -3$

1) $f'(x) = 3x^2 - 3$

2) $x = 1, x = -1$ $\quad 3x^2 - 3 = 3 \cdot (x^2 - 1)$

$x^2 - 1 = 0$

3) $\boxed{6x}$

4) $6 \cdot 1 > 0 \Rightarrow x = 1 \cup$ $\quad x = 1$ $x = -1$

$6 \cdot -1 < 0 \Rightarrow \cap$

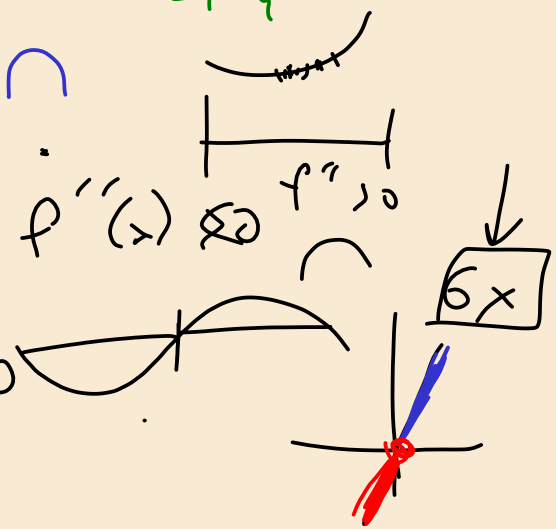
5) $0 \to 0$

$1 \to 6$

$-1 \to -6$

$f''(x) \lessgtr 0$ $\quad f'' > 0$

$\boxed{6x}$



$x_0 < x \quad f(x_0) < 0$

$x < x_0 \quad f(x_0) > 0$

domain

image range

inp-{