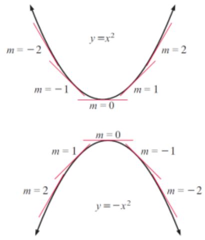
CONVEXITY AND INFLECTION
(FR: CONVEXITE ET INFLEXION)

Ecole Internationale PACA à Manosque Tle ES

1. CONVEXITY.

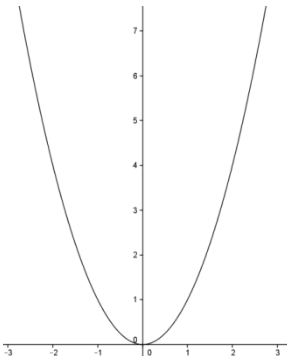
Definition

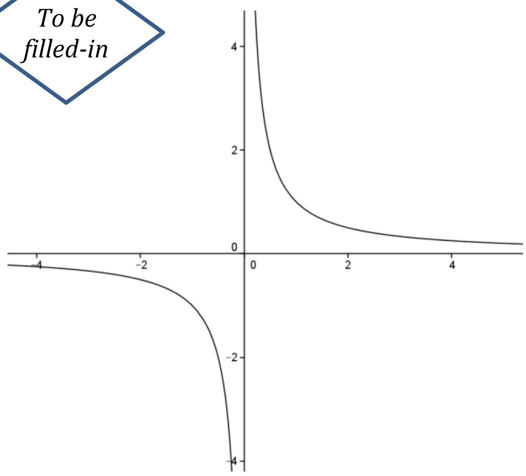
Let f be a differentiable function on an interval I and $\mathcal{C}$ its graph.
f is concave (or concave downwards) on I if $\mathcal{C}$ is entirely below any of its tangent.
f is convex (or concave upwards) on I if $\mathcal{C}$ is entirely above any of its tangent.

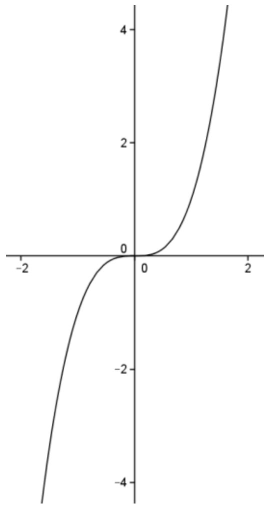


Examples:

To be filled-in







Note :  **concave** **convex** 

Property

A function f is concave on an interval I if, and only if its derivative f' is decreasing on I.

A function f is convex on an interval I if, and only if its derivative f' is increasing on I.

Consequence:

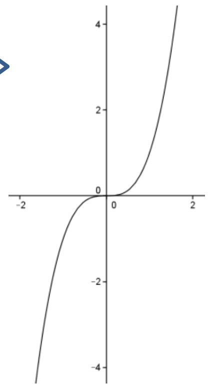
If its second derivative f'' is positive on I , then the function f is concave on I.

If its second derivative f'' is negative on I , then the function f is convex on I.

x	$-\infty$		a		$+\infty$
$f''(x)$		+	0	−	
$f'(x)$		↗		↘	
Convexity of f		 convexe		concave 	

2. INFLECTION

To be filled-in



> ***Definition***
> ***An inflection point is a point where the graph crosses its tangent.***

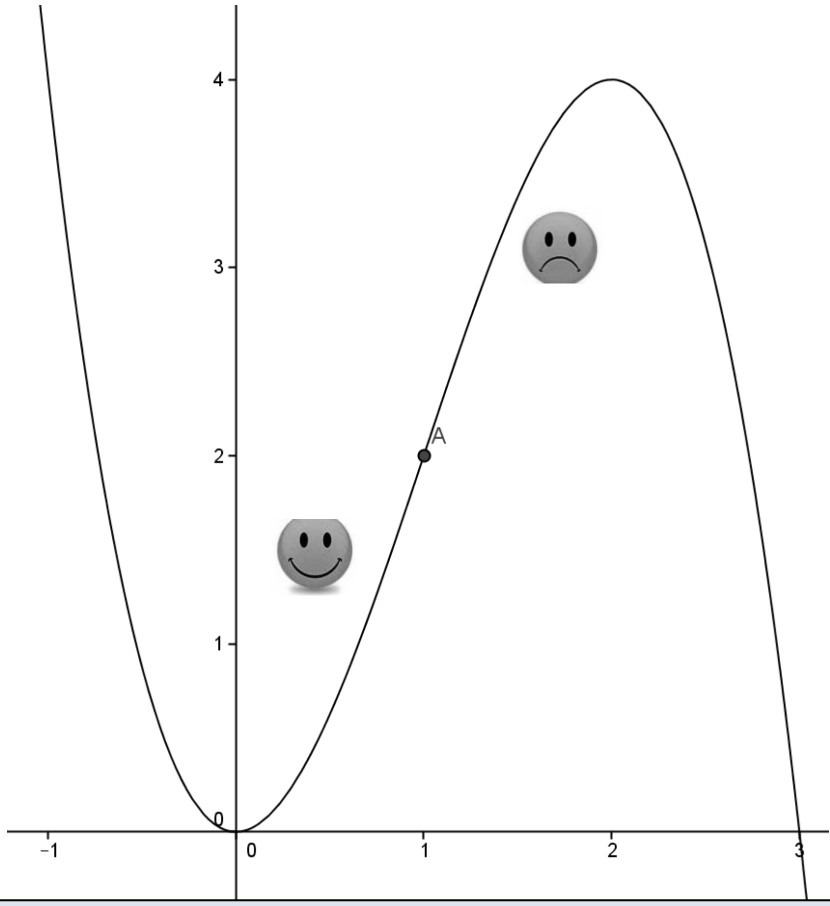
> ***Property***
> ***A inflection occurs when the second derivative vanishes and changes its sign.***

Notes :

1. An inflection point is where the concavity of the graph is changing
2. We can have an inflection point without having $f'(x)=0$.

Example :

Study the convexity of the function defined by $f(x)=-x^3+3x^2$



Bullet points of the chapter

- ✓ Recognizing graphically concave and convex functions
- ✓ Using the link between convexity of one function and sense of variation of its derivative
- ✓ Recognizing graphically an inflexion point
- ✓ Finding an inflection point