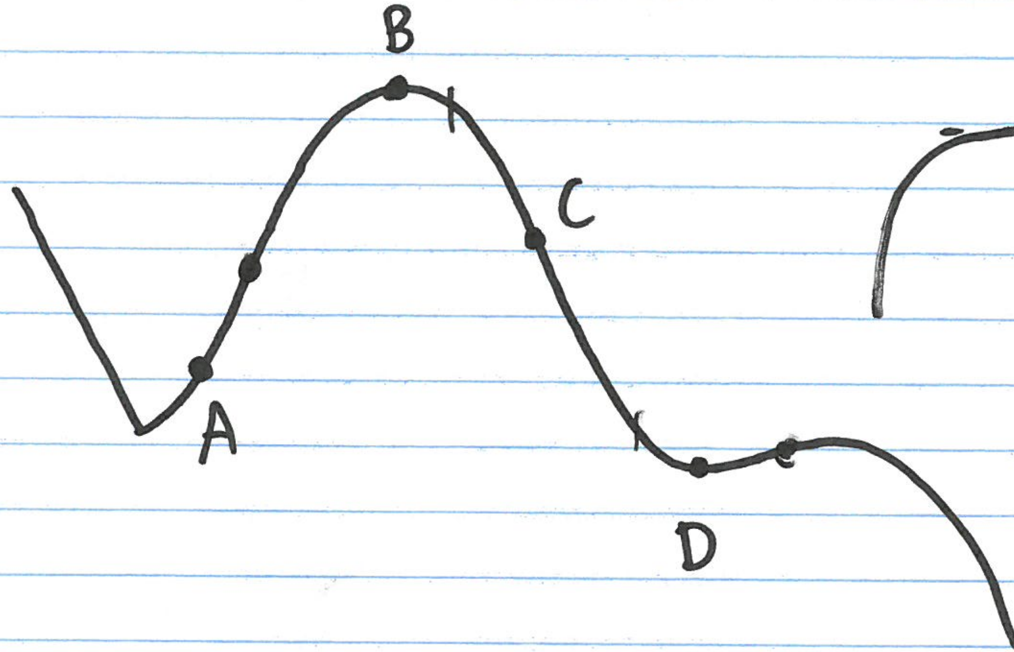
2/19

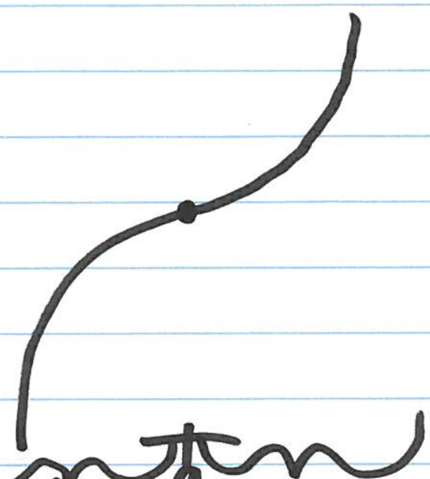
Office hours 2:45-3:45



	A	B	C	D	
f increasing	✓				
decreasing			✓		
slope of f increasing	✓	✓ ?		✓	?
decreasing		✓?			
inflection pt		?	✓		
concave up	✓			✓	
concave down		✓			

For Questions asking about how the slope changes, we have to look at the tangent lines and not the values of the function.

Finding inflection points using the second derivative.

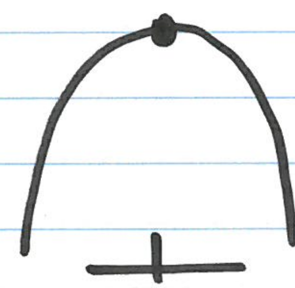


a

$f''(x)<0$ slope increasing

slope is decreasing $f''(x)>0$

$f''(a)=0$



a

$f'(x)>0$ $f'(x)<0$

$f'(a)=0$

Using 2nd derivative test

$f''(x) = 6x - 6$

$f''(0) = -6 < 0$ f is concave down at 0

0 is a local max

$f''(2) = 12 - 6 = 6 > 0$ f concave up at $x = 2$

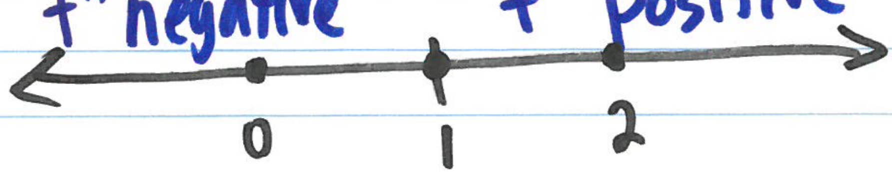
2 is a local min

To find inflection points, find where $f''(x) = 0$

$f''(x) = 6x - 6 = 0$

$\Rightarrow x = 1$ ← possible x-value of inflection point

We need to check whether f'' changes sign at $x = 1$.



an analogous sort of

So we can use (the same) approach to find inflection points that we used to find local max/mins.

Inflection points must occur ~~wher~~ at points $x=a$ where $f''(a)=0$.

As before, we need to determine whether $f''(x)$ changes sign at a.

Ex: Find local maxima, minima, and inflection points of

$$f(x) = x^3 - 3x^2 + 5$$

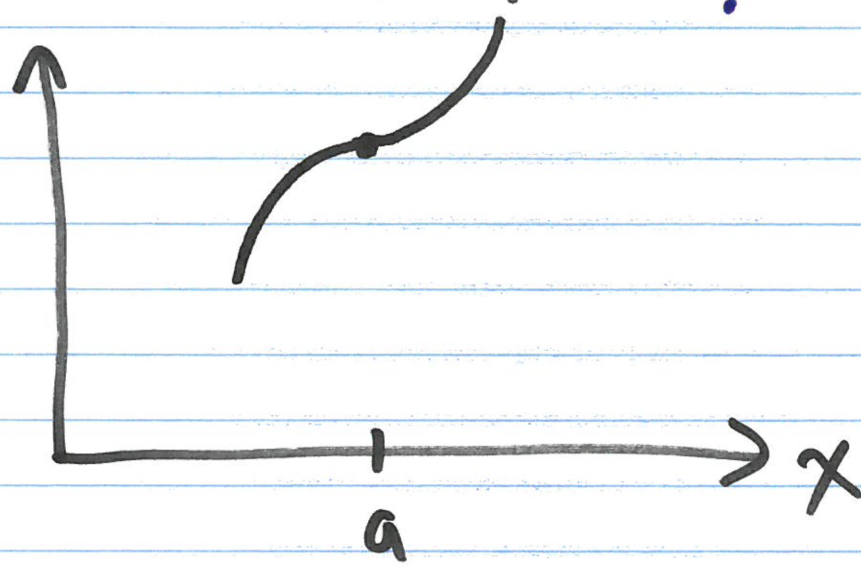
critical values:

$$f'(x) = 3x^2 - 3\cdot 2x^1 + 0$$
$$= 3x^2 - 6x = 0$$

$$3x(x-2) = 0$$
$$x=0 \quad \text{or} \quad x=2$$

f has an inflection point at $x=1$.

Is this an Example of a function with a local max and an inflection point at the same point?



No. ~~x=a is~~ f does not have a local max at a. We ~~found~~ ran into difficulty drawing a function with a local max and an inflection point at $x=a$.

In fact if f has a local max at $x=a$ then the tangent line is horizontal at $x=a$. But if f changes concavity at $x=a$, then f lies above the tangent line on one side of $x=a$ and below the tangent line on the other side of $x=a$.