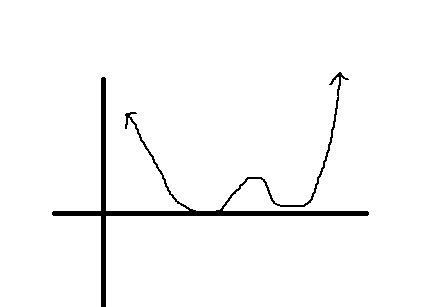
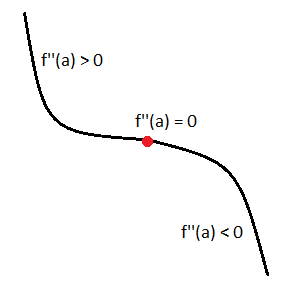
Local Max and Min  
Change of slope of tangent  
Critical points at B, C and D  
End points at A and E

Draw a function with a local min and max that does not have a hump or valley, and that is continuous…  
🡪 Such a function does not exist. Minima and maxima exist at critical points, which occur at the crests and troughs of any function.

Concavity

-Use your ruler to simulate a tangent line all along the curve; the point where you have to change the direction of your ruler is called the inflection point.   
Summary:

|  |  |  |
| --- | --- | --- |
|  | f’(x) | f’’(x) |
|  | f’(a) = 0 | f’’(a) > 0 Concave up |
|  | f’(a) = 0 | f’’(a) < 0 Concave down |
|  | f’(a) = 0 or DNE | f’’(a) = 0 Inflection point  🡪 changes from up to down or vice versa |

  
 Therefore, f’’(x) changes sign around a.

Ex) Find the points of inflection and the intervals of concavity for f(x) =   
  
f’(x) =

F’’(x) = 6x – 6

At the point of inflection, the function will change from concave up/down

|  |  |
| --- | --- |
| x<1 | x>1 |
| - (concave down) | + (concave up) |

F’’(x) = 0 = 6x – 6  
x=1  
Therefore, the function changes at x=1. So, we need to see what it does on either side of the inflection.   
Use the second derivative test to test intervals on either side of the point of inflection.   
  
  
Ex) Find and classify the critical points using the second derivative tests

f(x) =

f’(x) =   
f’(0) =   
0 =   
0 = 3x (x-2)  
x = 0,2  
Therefore, the critical points are (0,2) (2,-2)  
  
f’’(x) = 6x-6  
f’’(0) = -6 🡪 concave down  
f’’(2) = 6 🡪 concave up