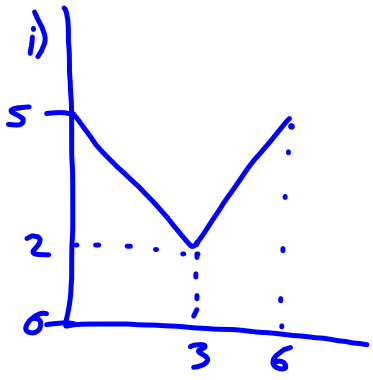
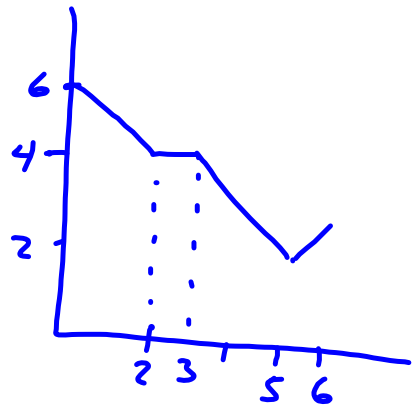
a) i)



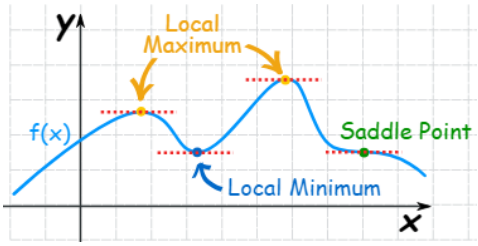
ii)



Lesson 2.05: Solving Problems Involving Rates of Change

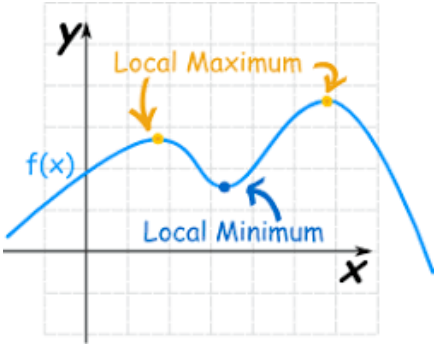
Learning Goals:

- I know what a global maximum and a global minimum is;
- I know what a local maximum and a local minimum is;
- I know when it is required to calculate a rate of change;
- I can calculate the exact rate of change.



Local Maximum or Minimum

Given y = *f (x)*. For values of x near c ...



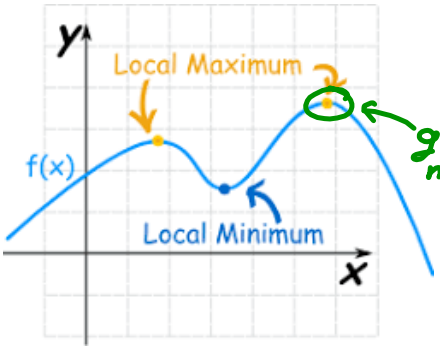
A local maximum at x = c exists if the function's rate of change changes from positive to negative through x = c.

A local minimum at x = c exists if the function's rate of change changes from negative to positive through x = c.

In both cases, at x = c the rate of change will be zero (or undefined).

Global Maximum or Minimum

Given y = *f (x)*...



A global maximum at x = c exists if *f(c) > f(x)* for all values of x in the function's domain.

A global minimum at x = c exists if *f(c) < f(x)* for all values of x in the function's domain.

Example 1

Using the First Principles Difference Quotient, prove that a local minimum value occurs at x = 3 for the function $f(x) = x^2 - 6x + 5$. Verify graphically.

$$\frac{f(x+h)-f(x)}{h},\ h\to 0$$

$$= \frac{(x+h)^2-6(x+h)+5-[x^2-6x+5]}{h},\ h\to 0$$

$$= \frac{x^2+2xh+h^2-6x-6h+5-x^2+6x-5}{h},\ h\to 0$$

$$= \frac{h^2+2xh-6h}{h},\ h\to 0$$

$$= \frac{h(h+2x-6)}{h},\ h\to 0$$

$$= h+2x-6,\ h\to 0$$

$$= 2x-6$$

$x<3$	$x=3$	$x>3$
$2(2.9)-6$	$2(3)-6$	$2(3.1)-6$
$= 5.8-6$	$= 6-6$	$= 6.2-6$
$= -0.2$	$= 0$	$= 0.2$

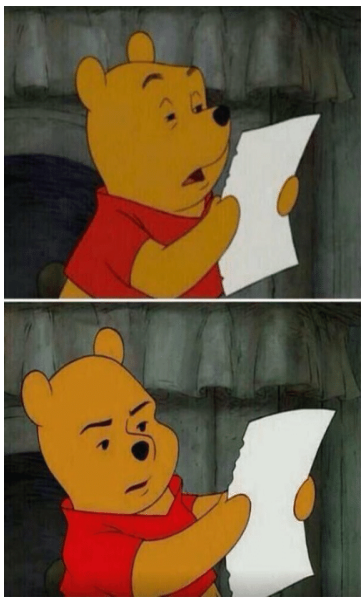
$f(x) = \cos x$

$$\frac{f(180+h)-f(180)}{h}$$

$$= \frac{\cos(180+h)-\cos(180)}{h}$$

Homework

Use the First Principles Difference Quotient for all Rate of Change calculations
pg. 111-113 #1, 3, 4, 6c, 9a, 10, 14



Staring at my math homework like