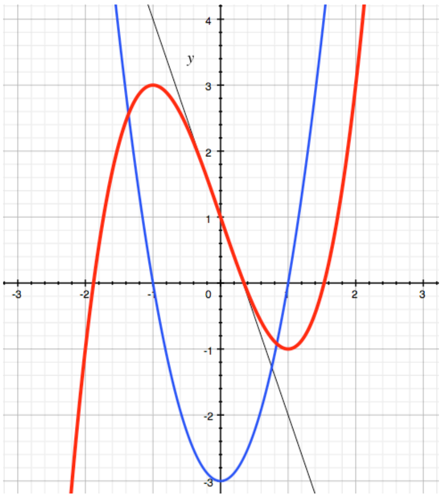
Derivative vs Differential

1. *Let* $f(x) = x^3 - 3x + 1$
2. *First Derivative* $f'(x) = 3x^2 - 3$
3. *Zeroes of* $f'(x) = \{-1 ; 1\}$, *Two changes of sign => Two extrema*
4. *Seconde Derivative :* $f''(x) = 6x$
5. *Zero of the second derivative :* $x = 0$, $f''(x)$ *changes sign at 0.*
6. *Equation of the tangent line to the point* $A(0;1)$: $y = f'(0).x + f(0) = -3x + 1$
7. *Chart of the variations of f :*
8. *Graph of f , f' and the tangent line in A(0;1)*

x	$-\infty$
Sign [f '(x)]	
Variations of f	



Problem I :

1. *Find the aproximate value of f(0.05) without calculator (Use the differential of f at x=0)*

2. *Same question for f(1.99).*

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3. *Problem II : Let T be the function defined by* $T(l) = 2\pi\sqrt{\frac{l}{g}}$

where g is the gravitational constant

[If l is in meters and $g = 9.81\ m.s^{-2}$ *, then T(l) is the period in seconds of a long pendulum]*

a. *Find the derivative T'(l).*
b. *Find the expression of the differential of T at l =1.*
c. *Suppose that because of the change in temperature, the length of the pendulum increases by dl = +0.02 m.*
Find the approximate new value of T : T(1.02) without calculator.