

**BOOKLET 4b**

###### Mathematics Methods 3&4

# GRAPHS OF DERIVATIVE FUNCTIONS:

2018

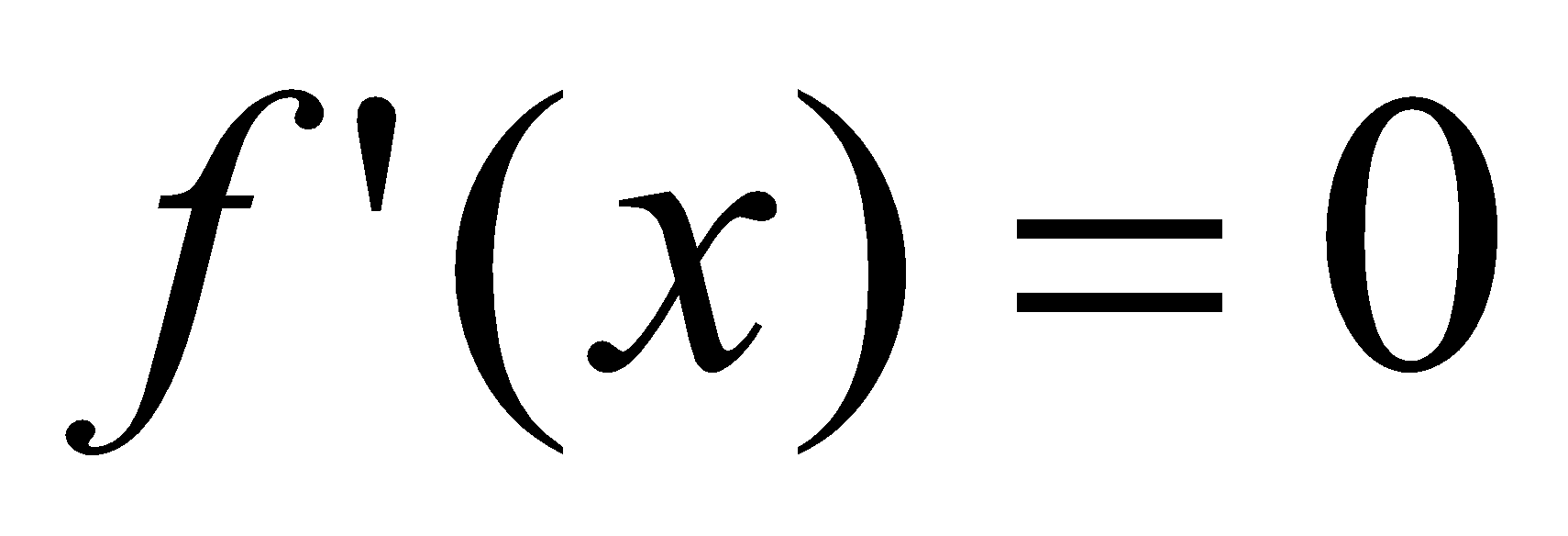
B: **GRAPHS OF DERIVATIVE FUNCTIONS:**

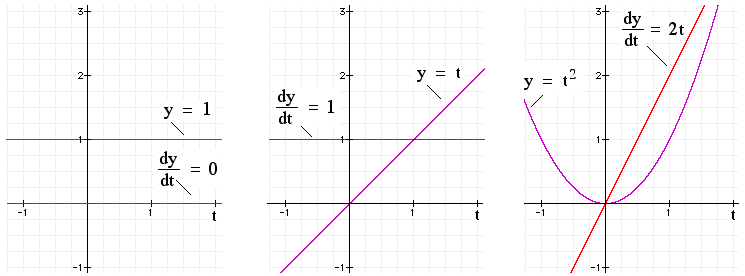
1. **Sign of the gradient – Positive if the part of the graph is rising from left to right**

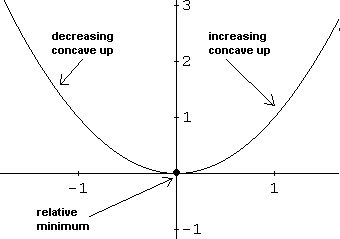


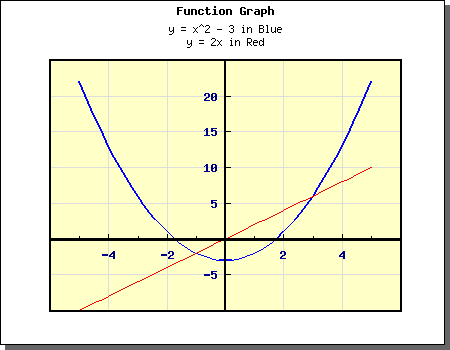
1. **Negative gradient if it is descending from left to right.**

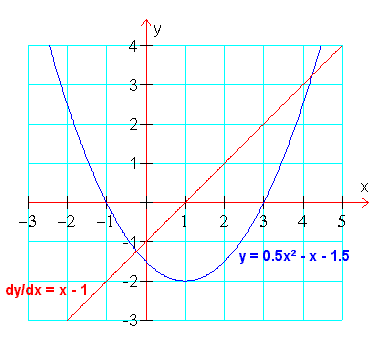


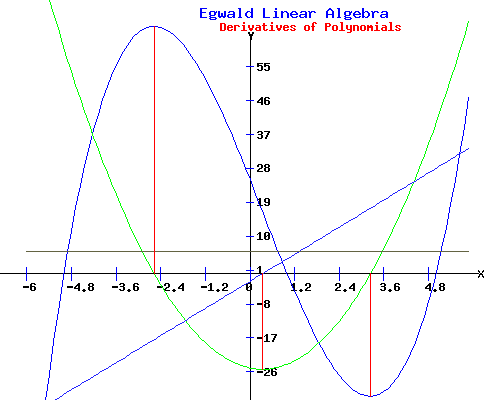
1. **At turning point or point of inflection the gradient = 0 i.e at turning point or point of infection**
2. **Horizontal line has gradient of zero.**

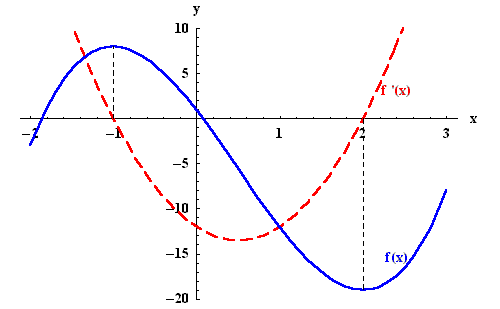


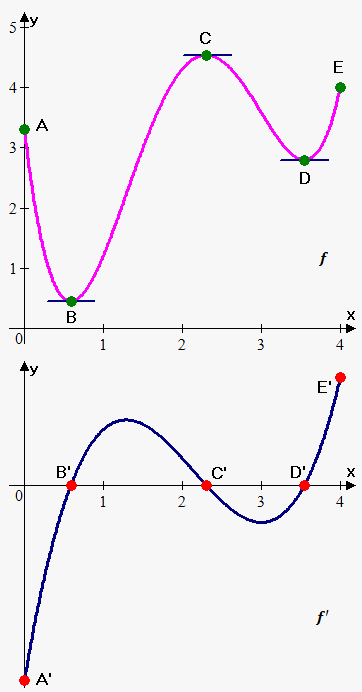




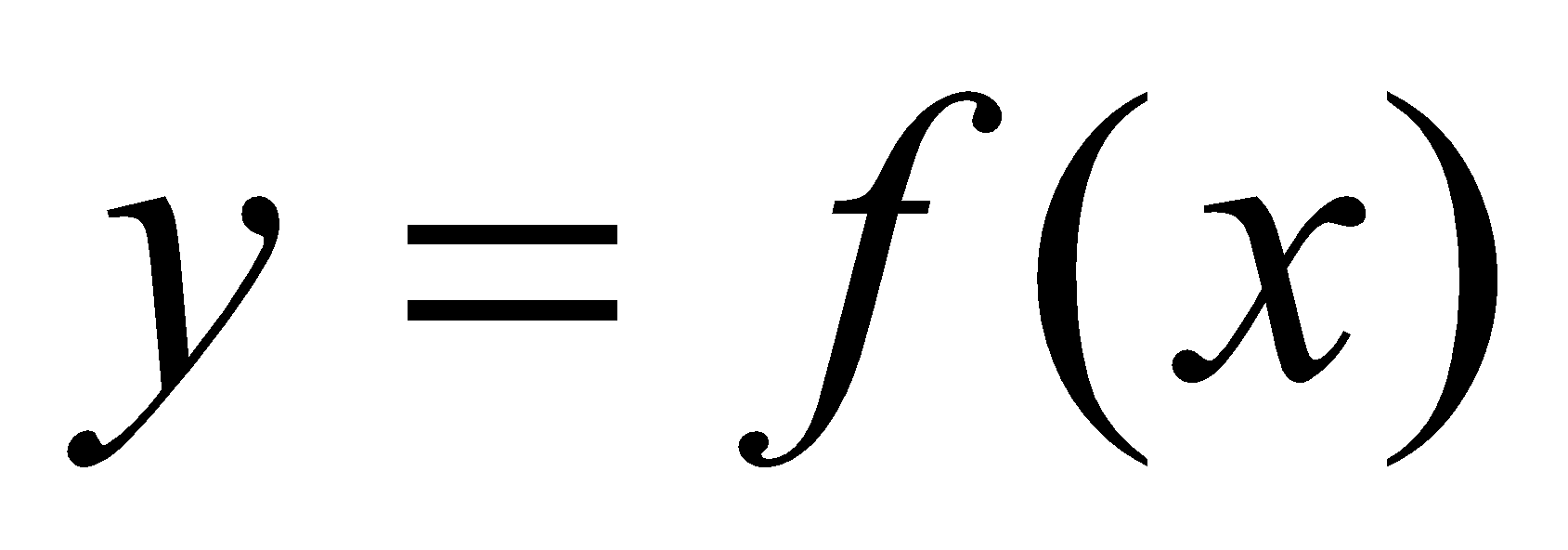
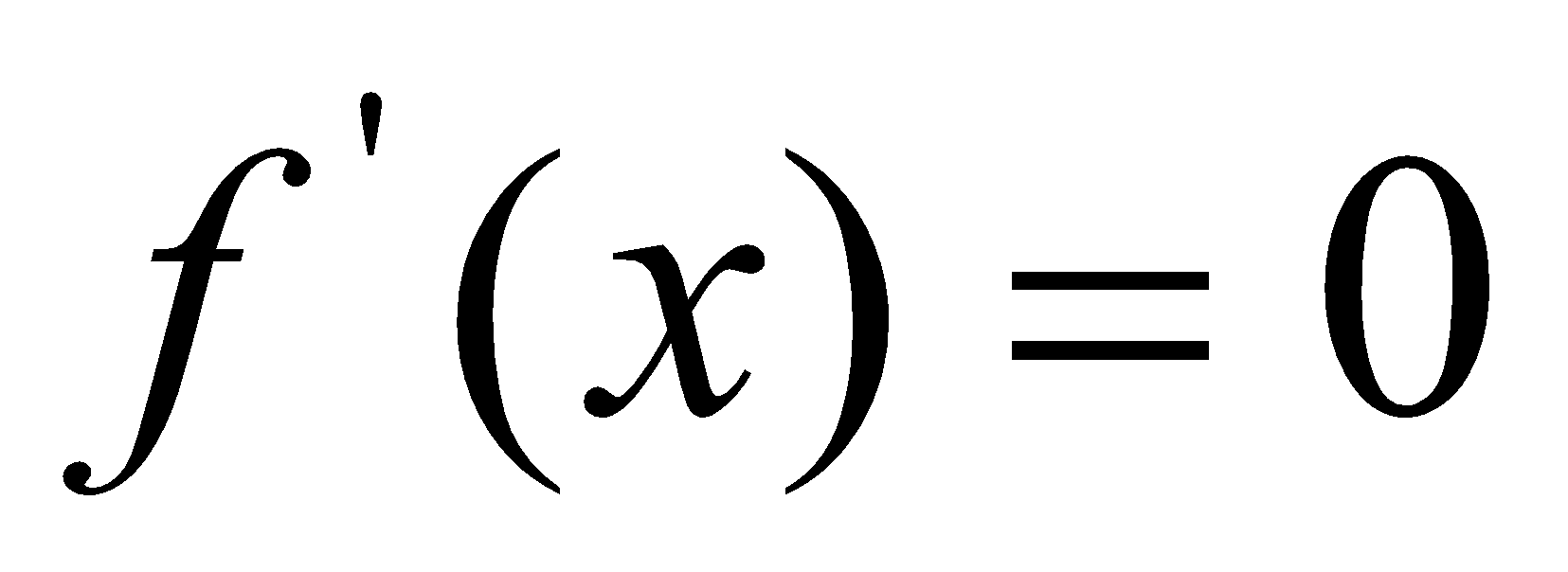
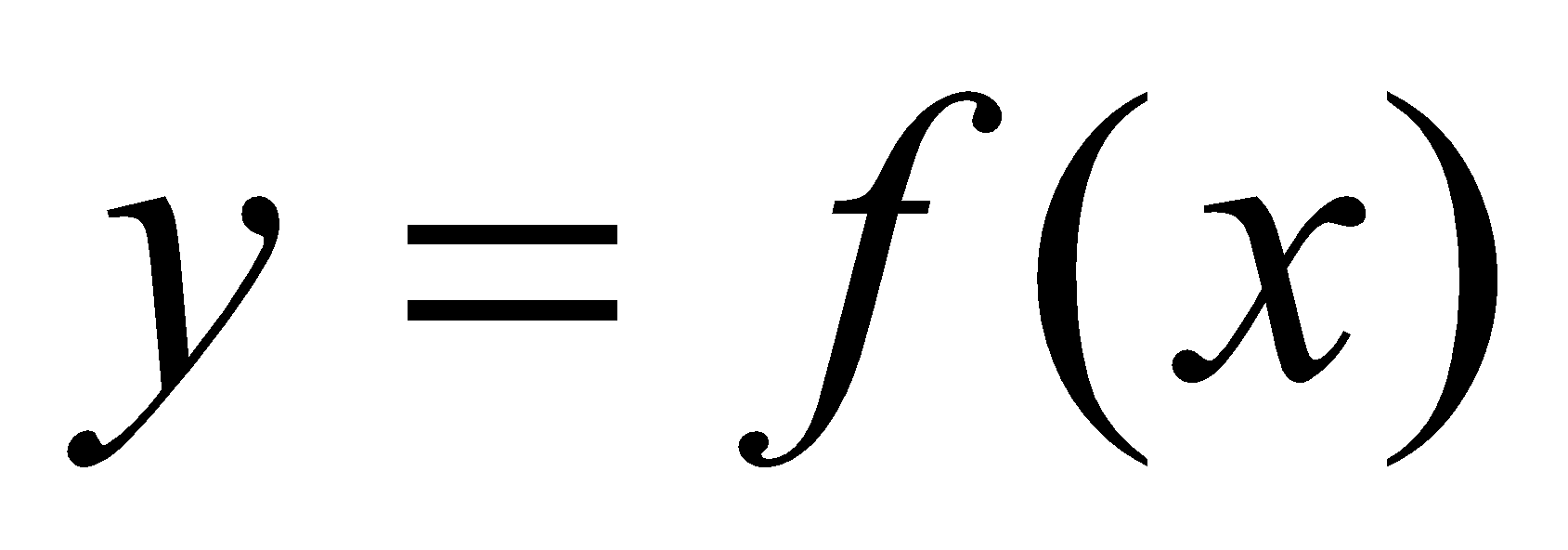
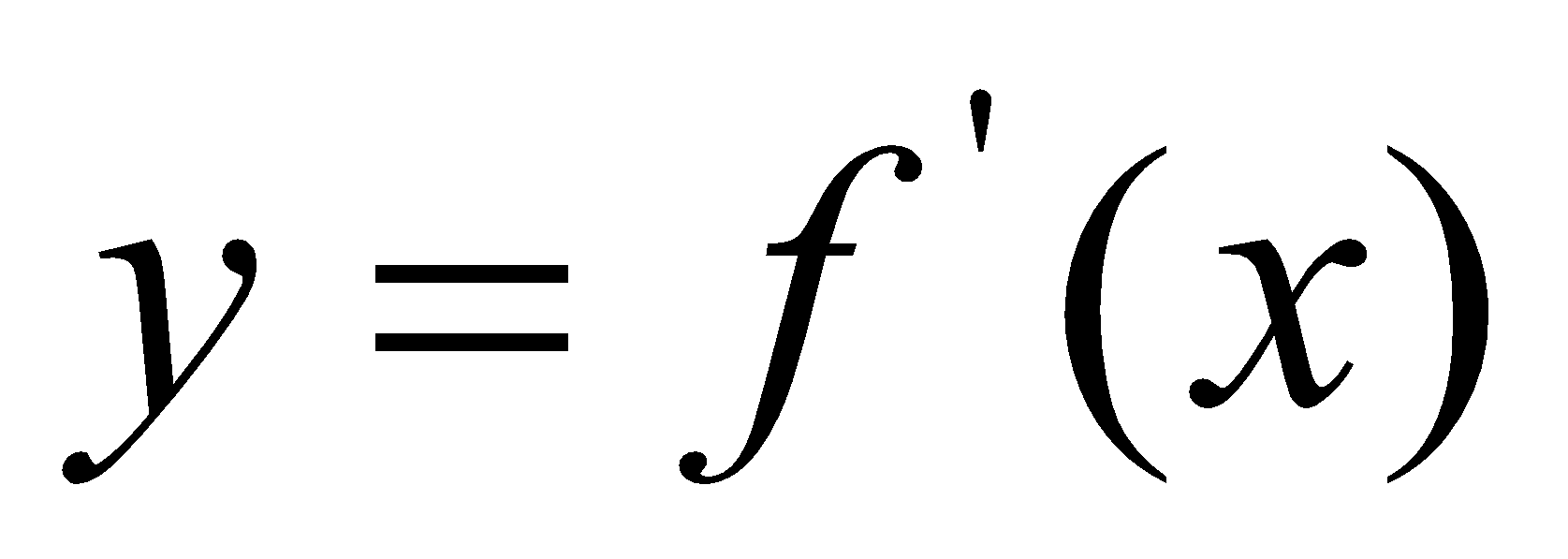
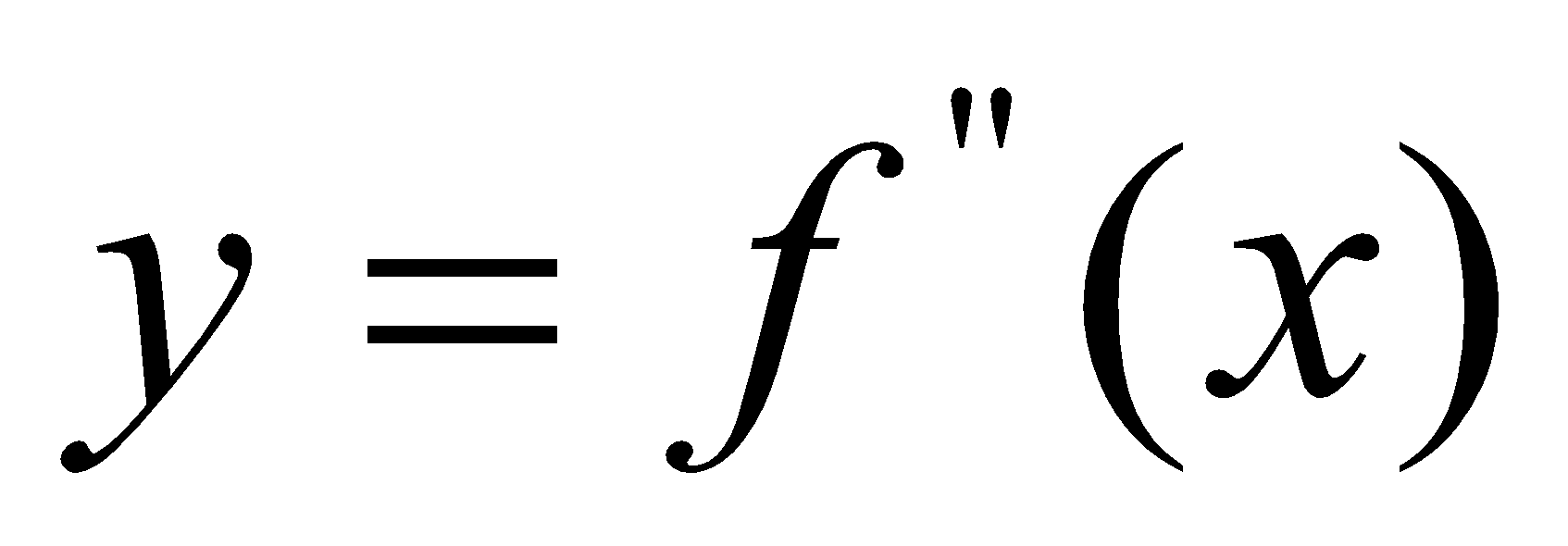
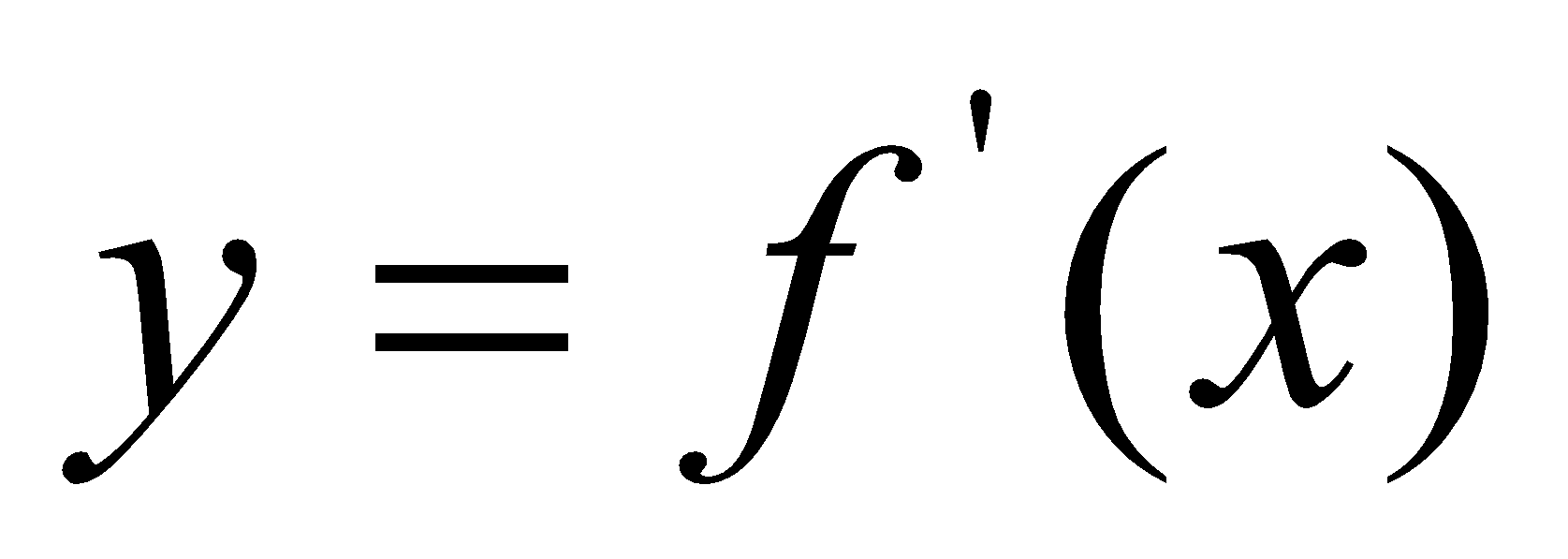
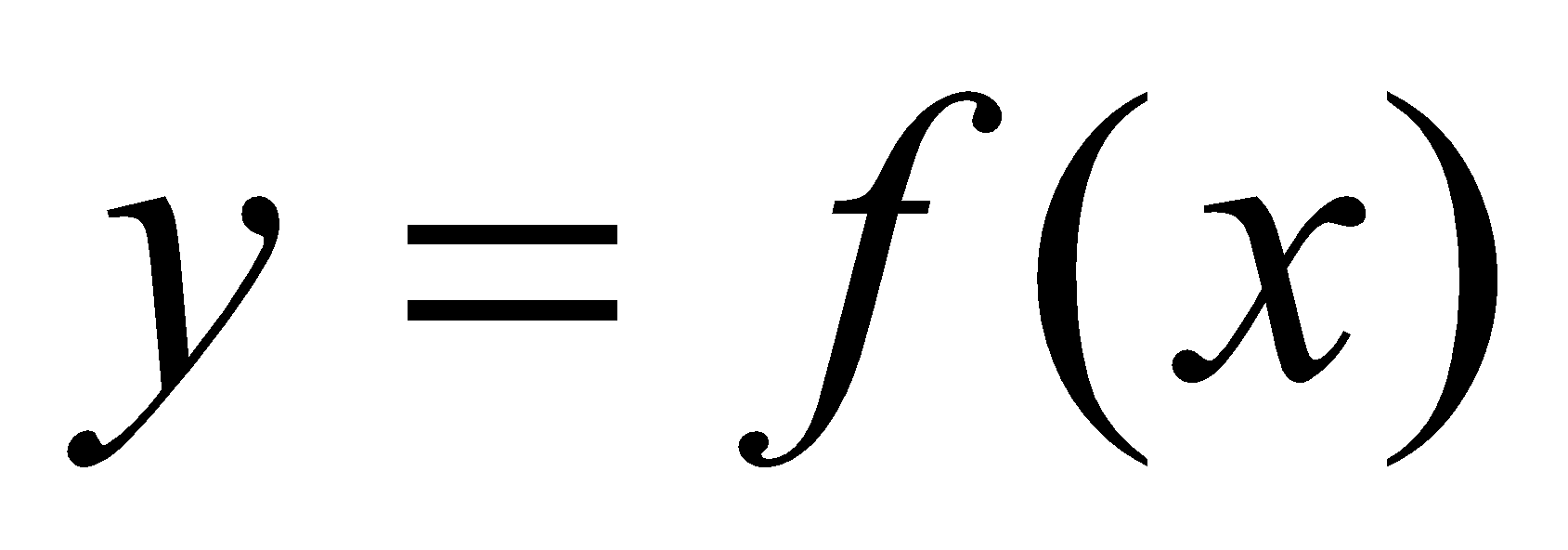
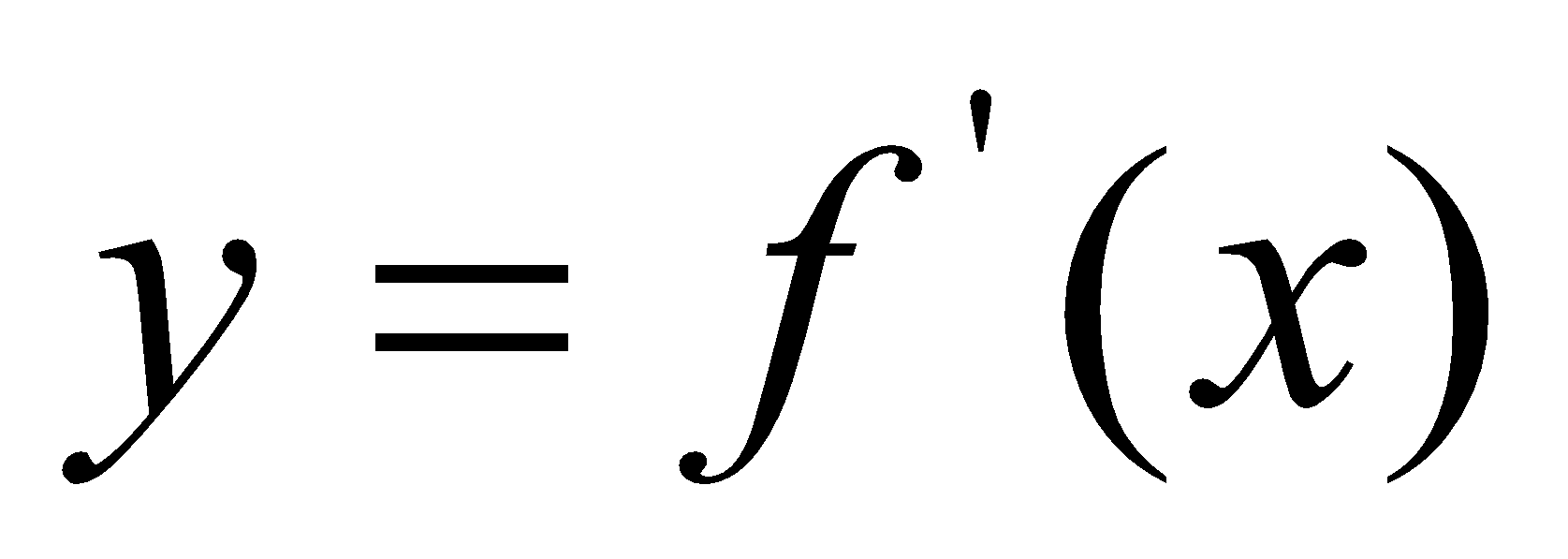
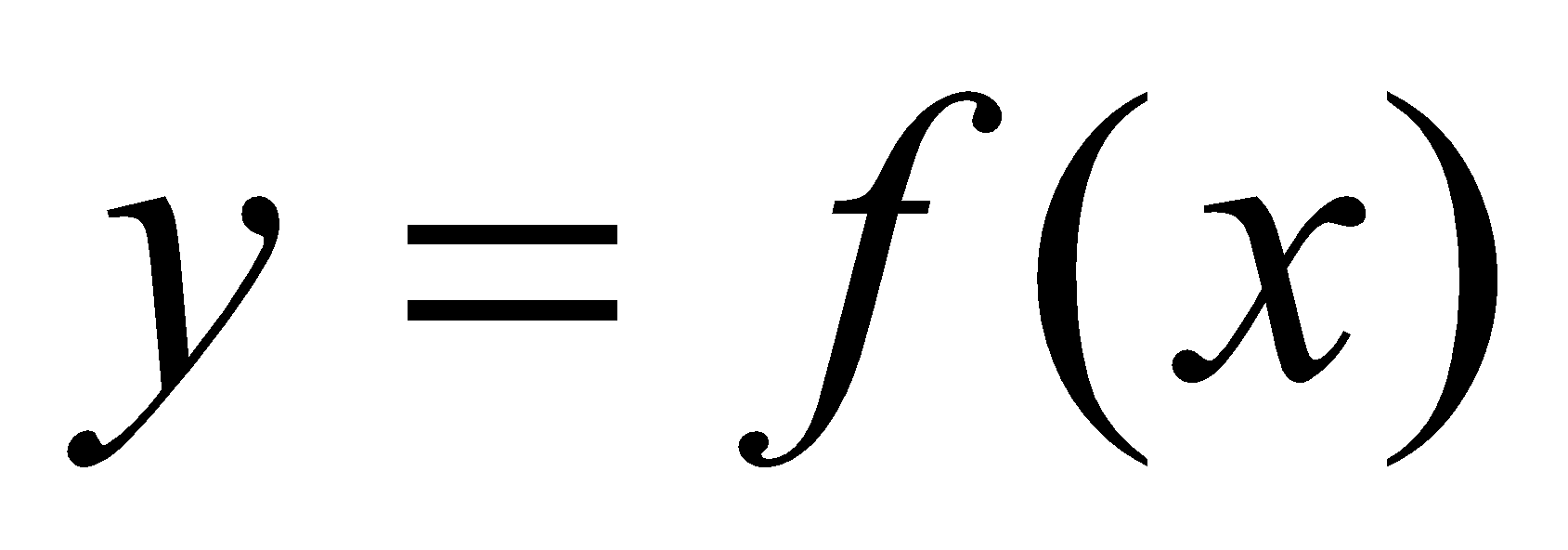
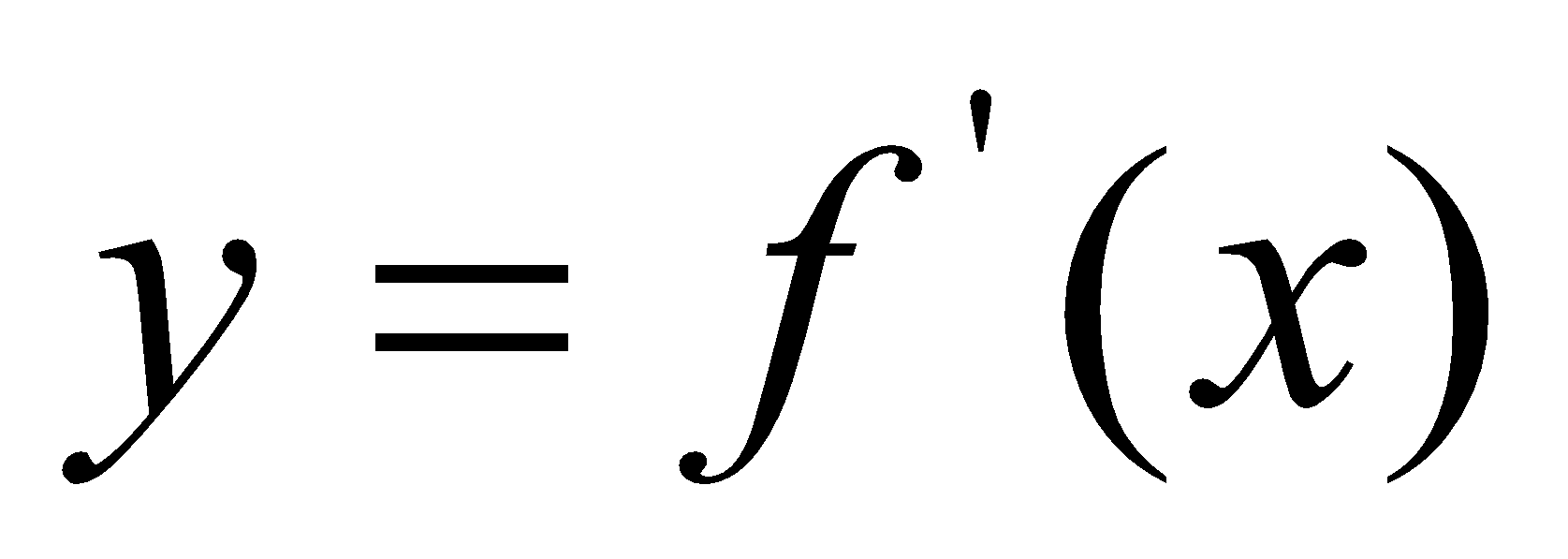
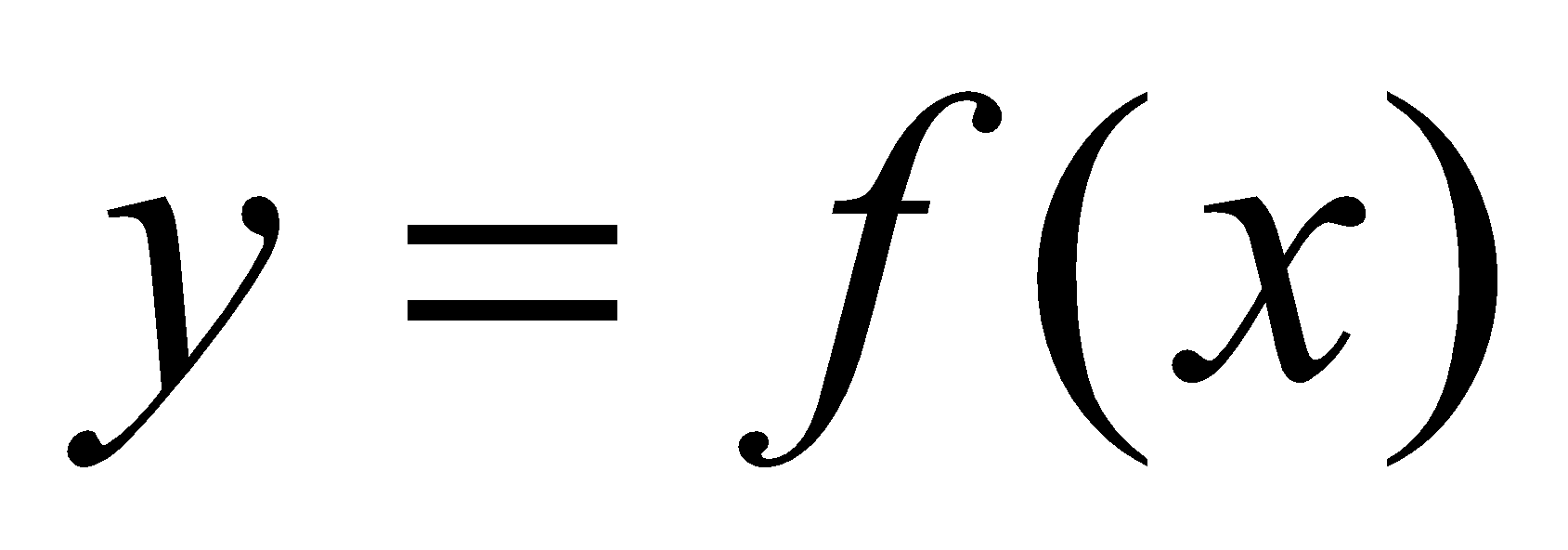




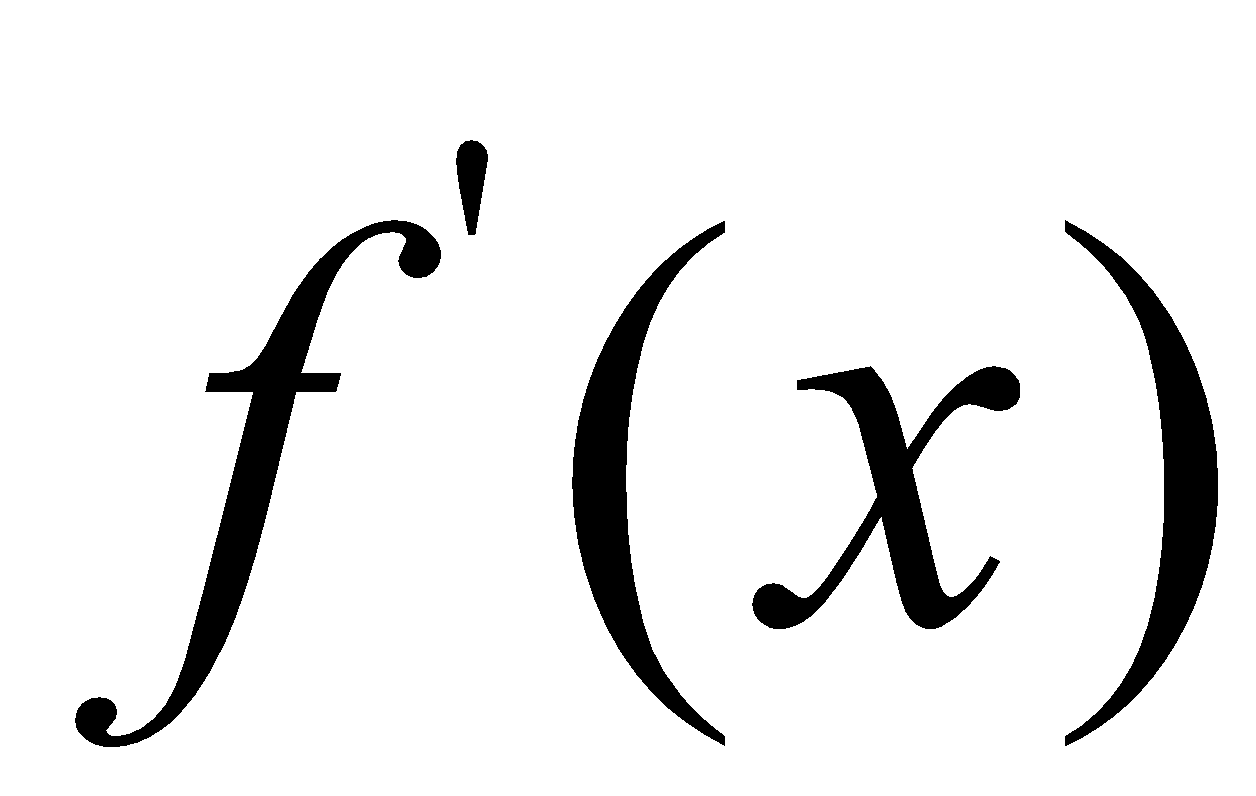
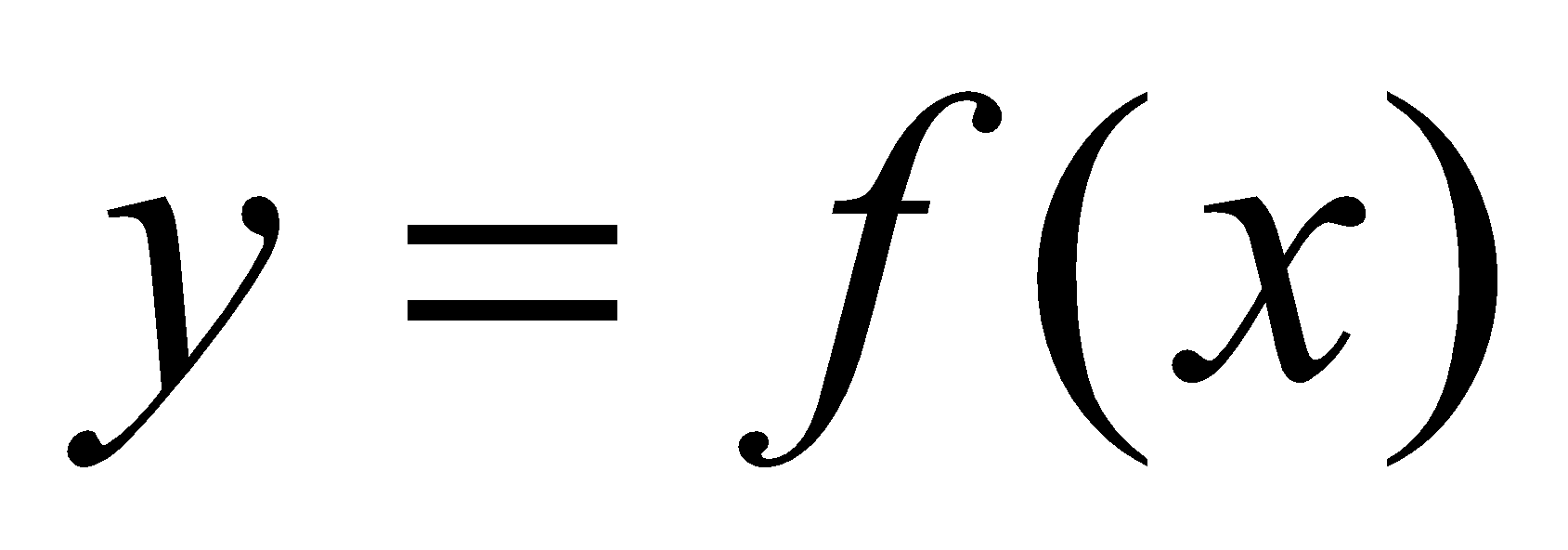


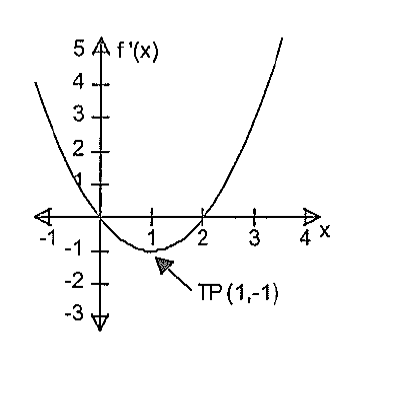


**Summary**

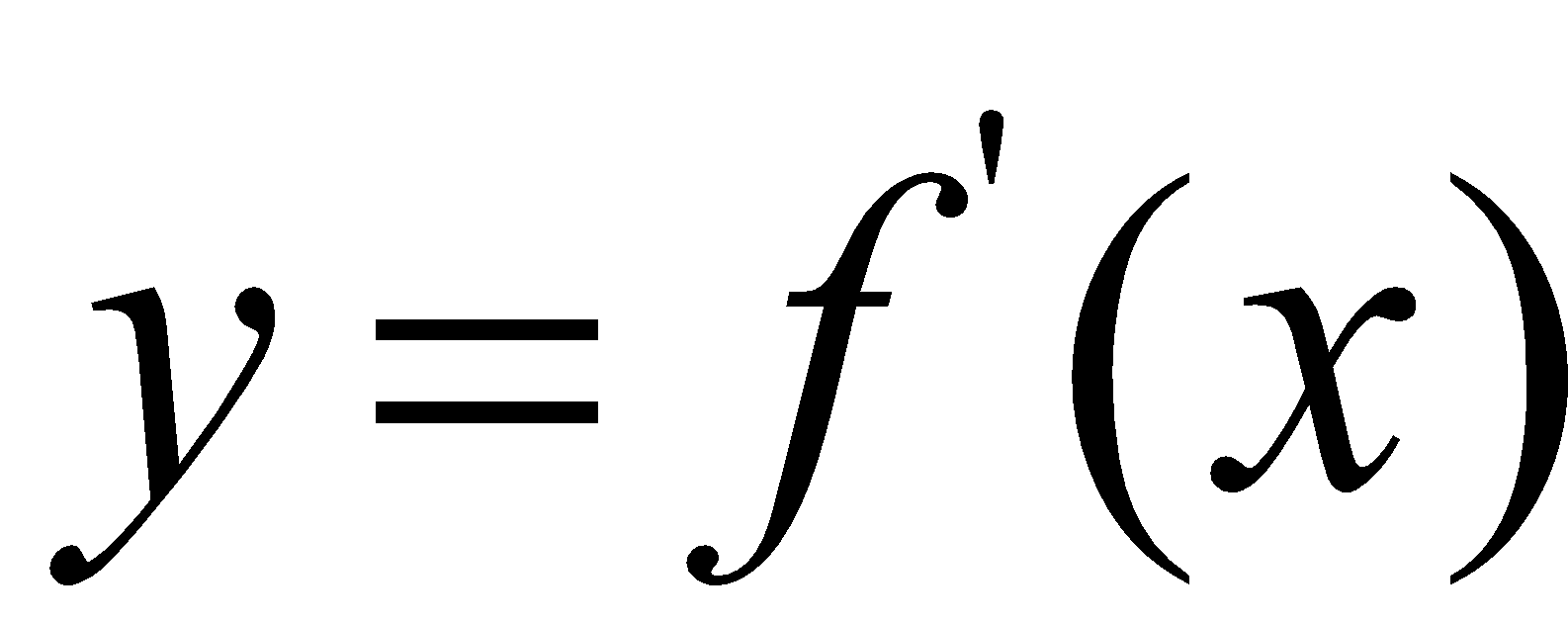
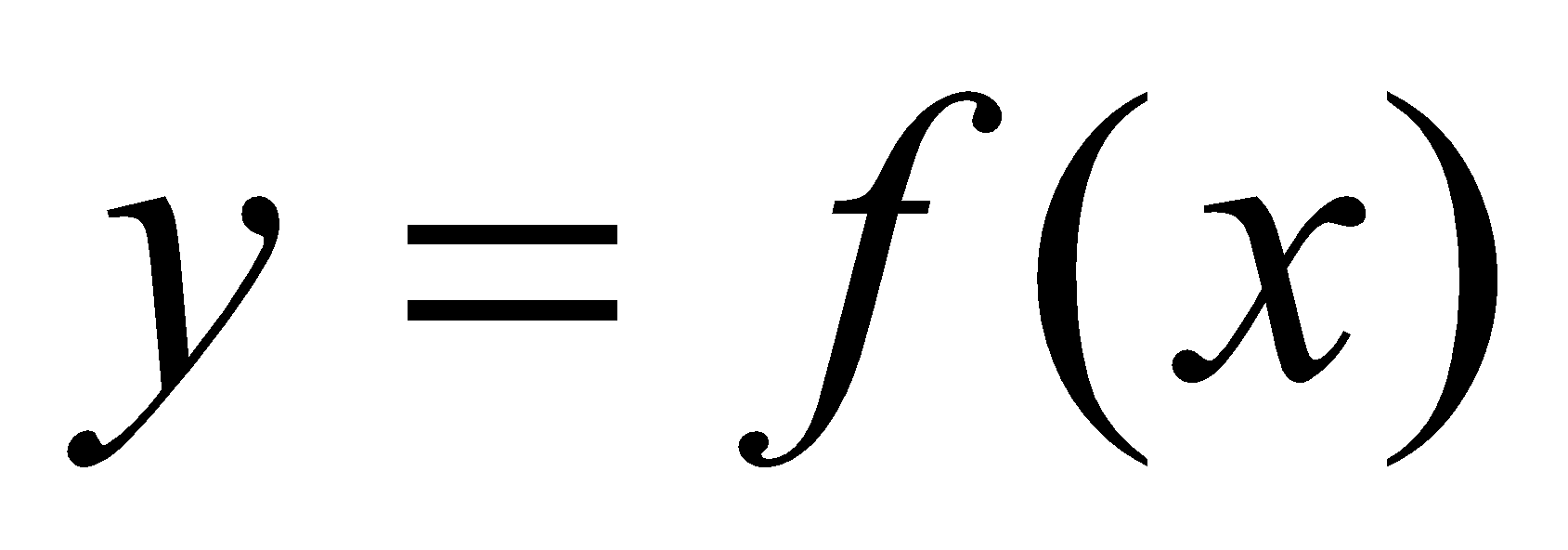
* A turning point on  occurs when, . This is at a point when the curve is horizontal.
* A point of inflection on  corresponds to a turning point on the  and a horizontal intercept on 
* A horizontal intercept on  corresponds to either a turning point or a horizontal inflection point on 
* A turning point on  corresponds to an inflection point on. A turning point which is also a horizontal intercept is also a horizontal intercept on  corresponds to a horizontal inflection point on 

**EXAMPLE:**

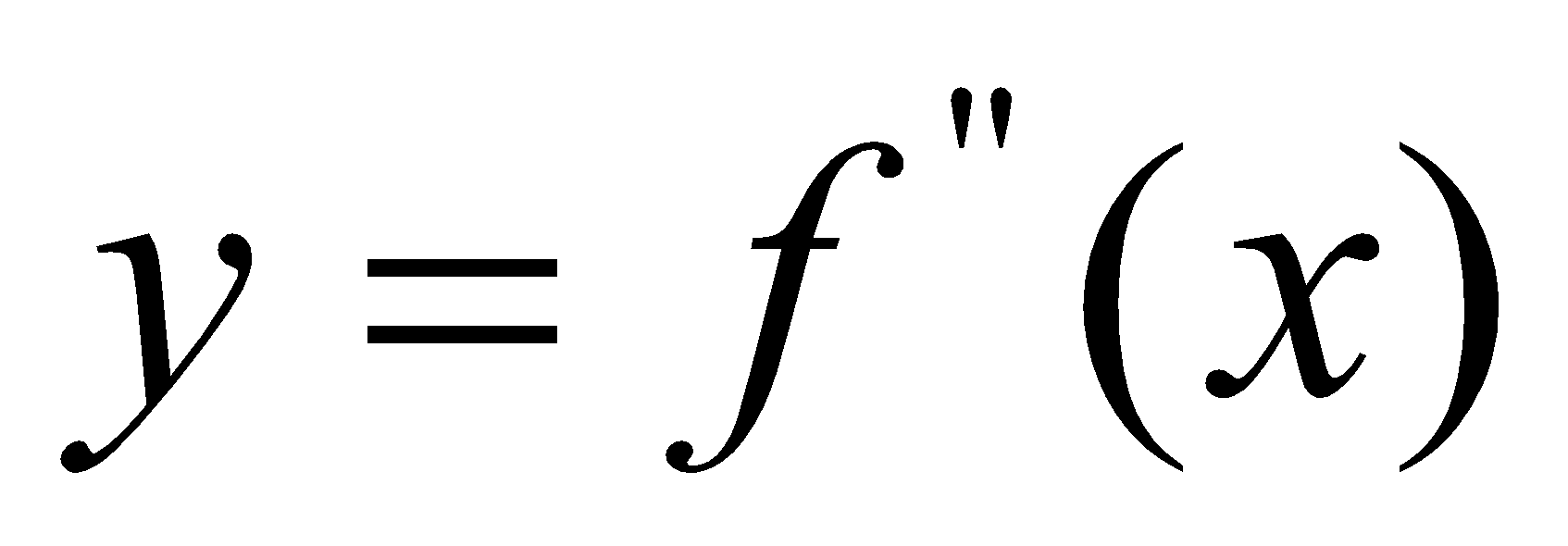
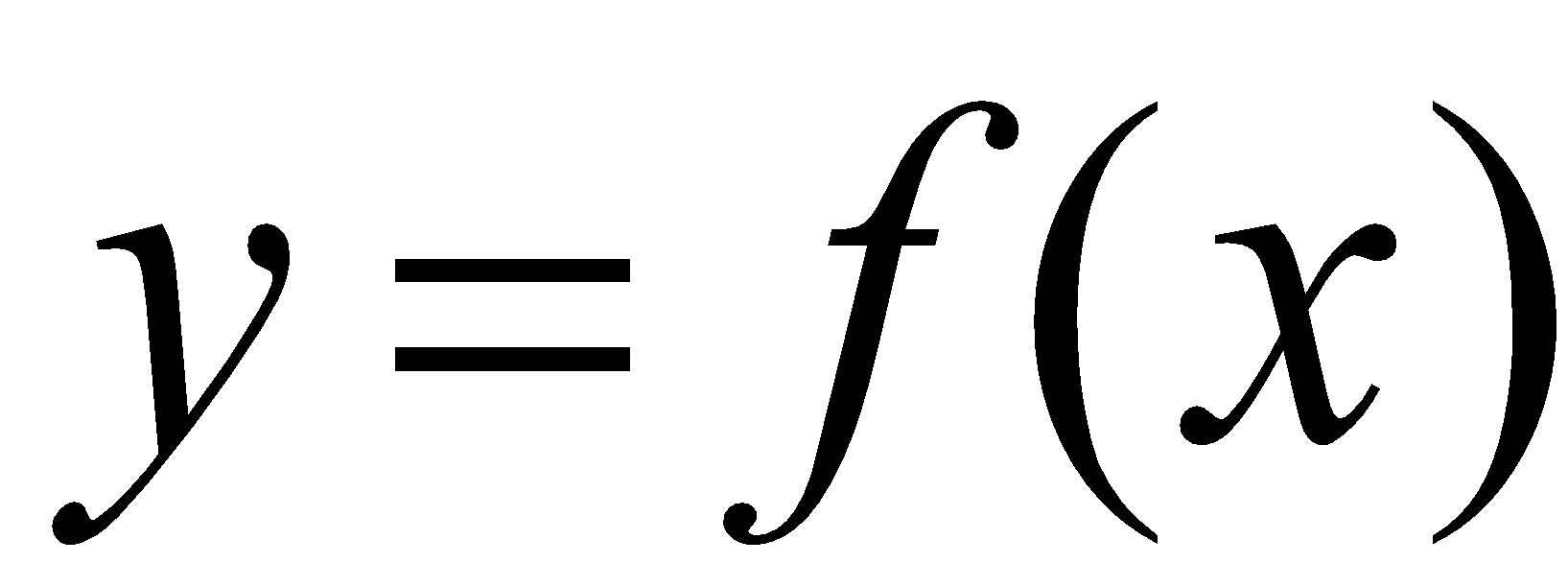
The following diagram is for the function. Determine the x – coordinates of the turning point(s0 and inflection point(s) of 

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**Solution:**

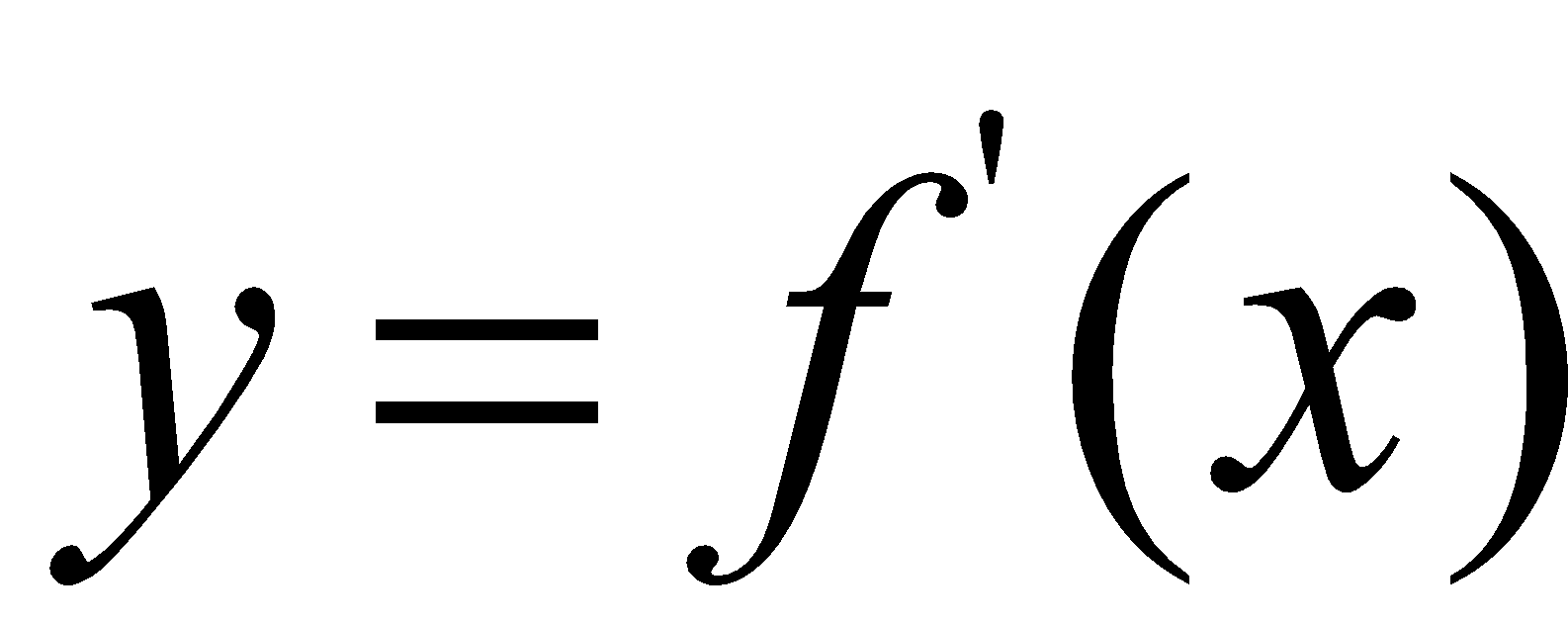
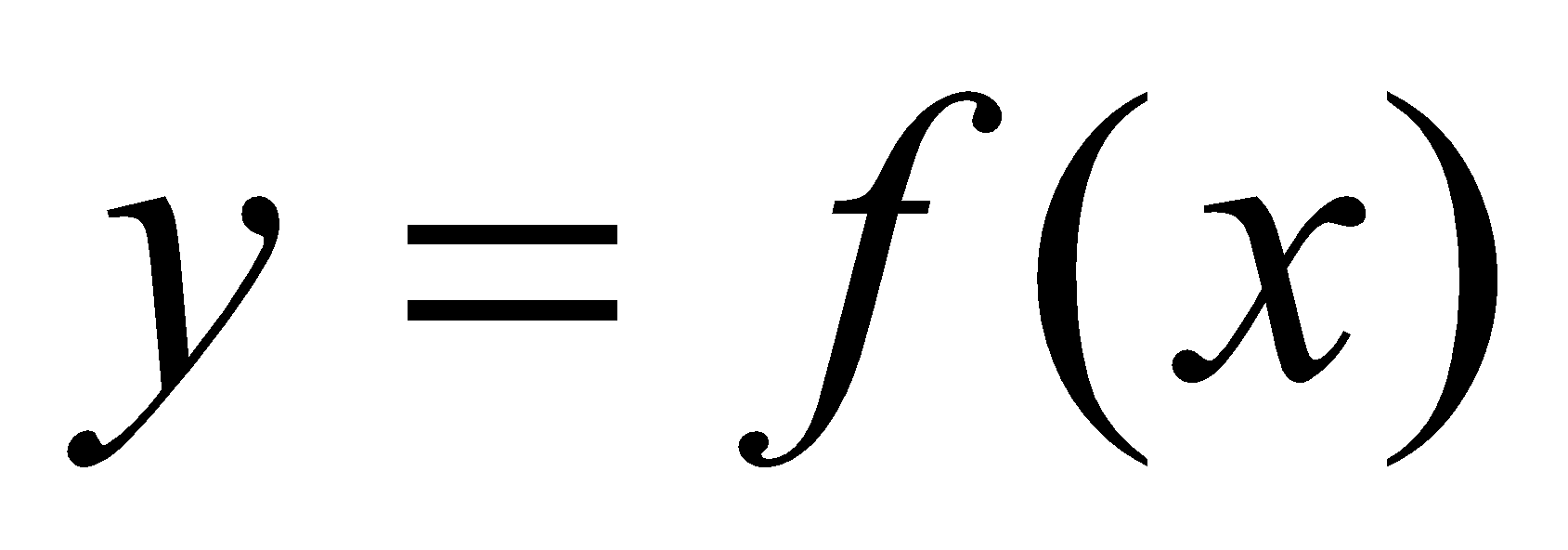
 intersects the x – axis at *x* = 0 and *x* = 2. Hence  has turning points at

*x* = 0 and *x* = 2.

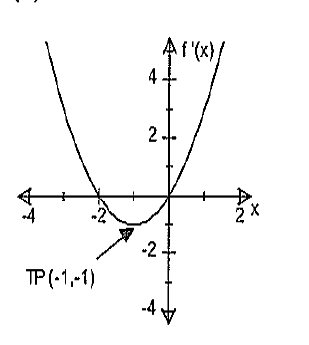
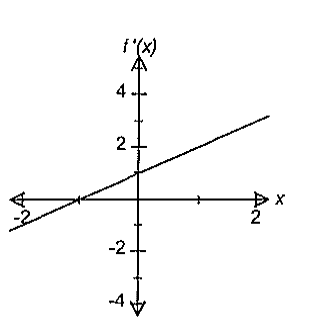
 has a turning point at x = 1. Hence  has an inflection point at *x* = 1.

**EXERCISE 2:**

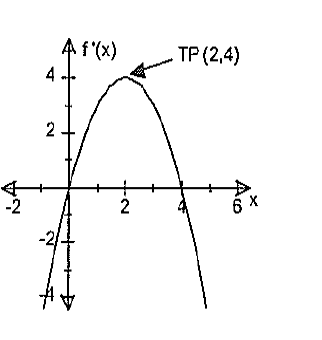
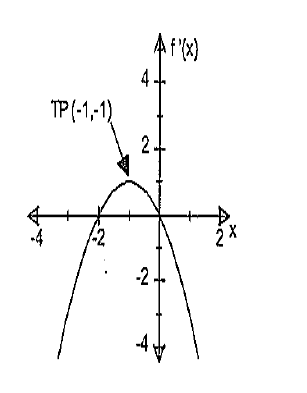
**Question One.**

Given the sketch of , determine the x – coordinates of the turning point(s) and inflection point(s) of 

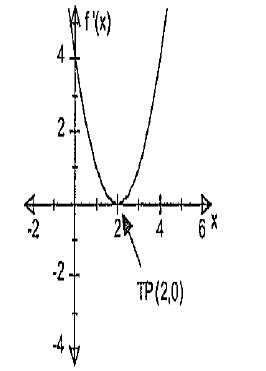
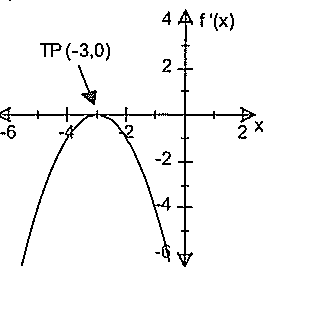
**(a) (b)**

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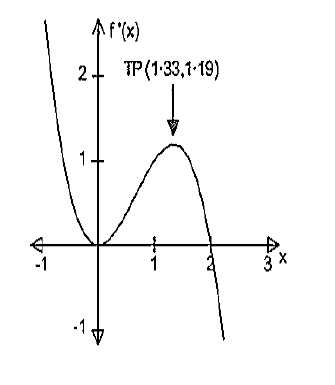
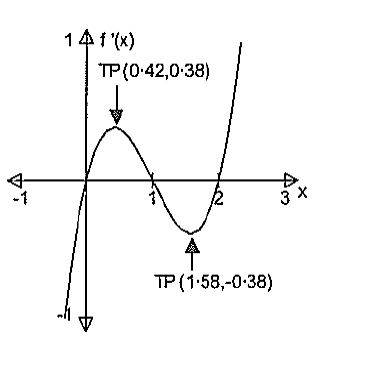
**(c) (d)**

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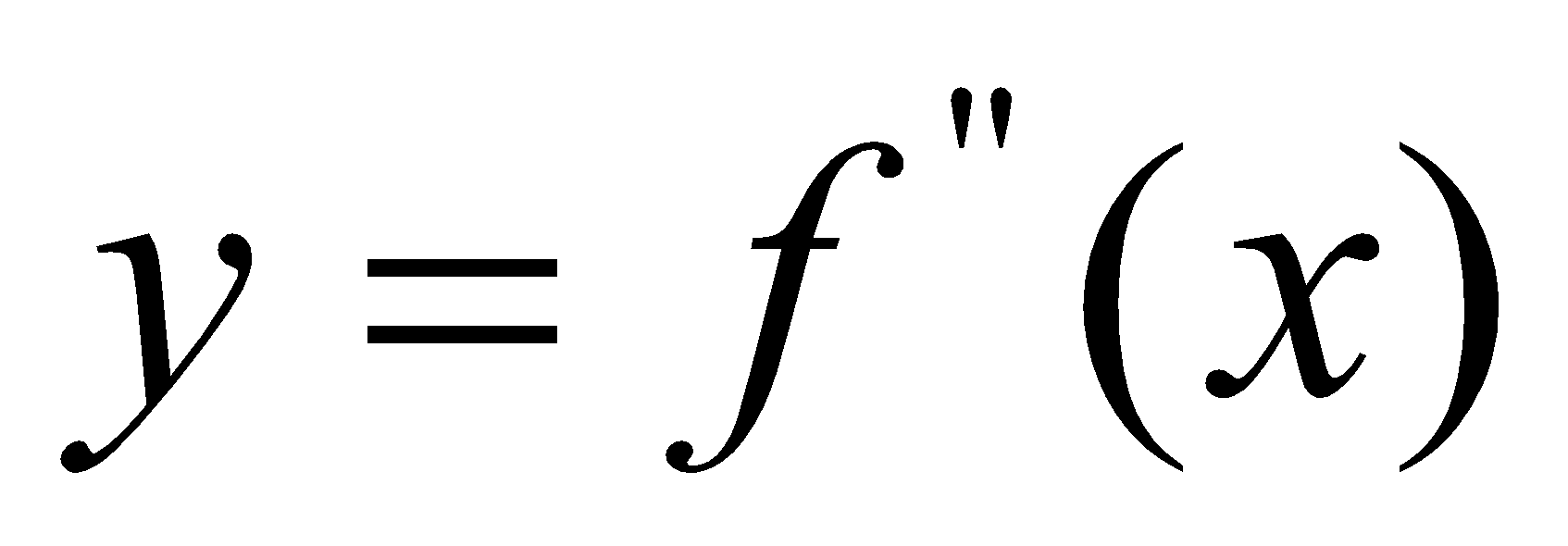
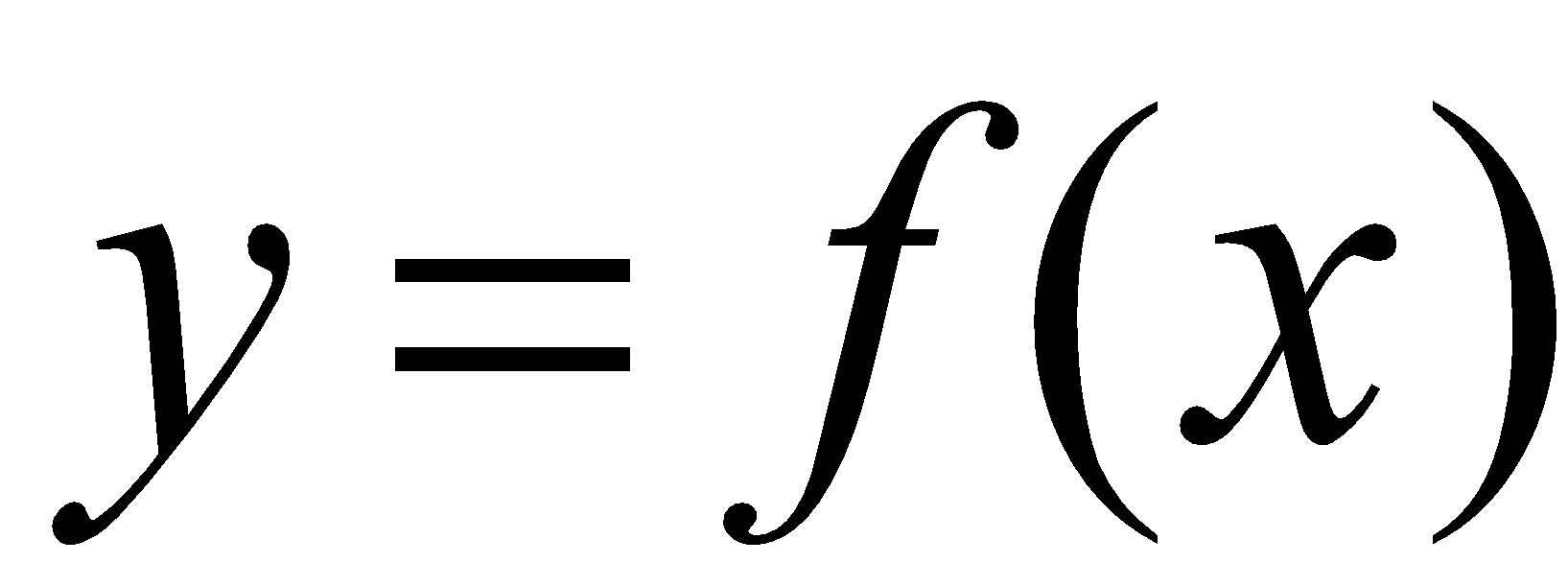
**(e) (f)**

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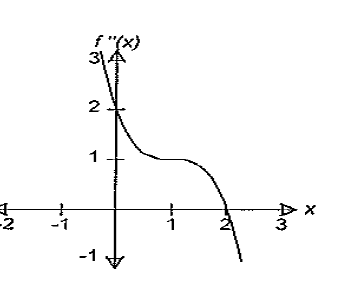
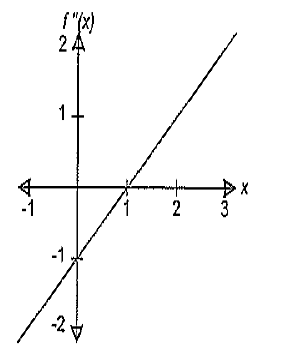
**(g) (h)**

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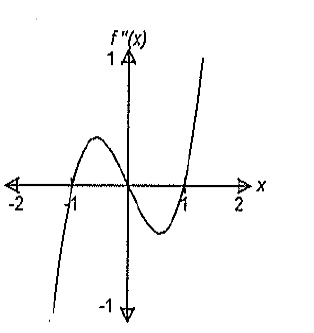
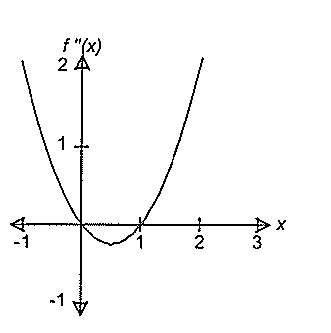
**Question Two**

Given the sketch of, determine the x – coordinate of point(s) of inflection of  where it/they exist(s)

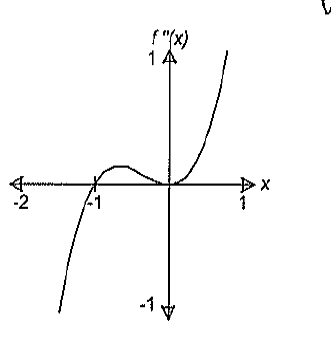
**(a) (b)**

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**(c) (d)**

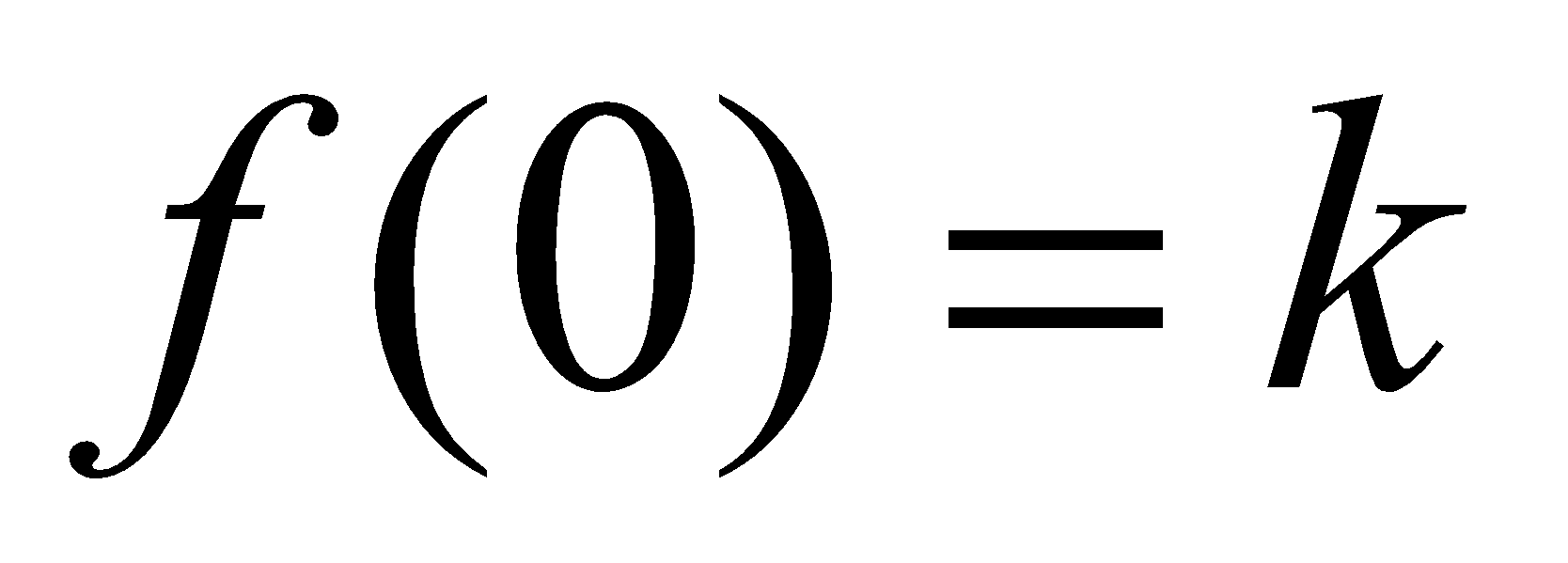
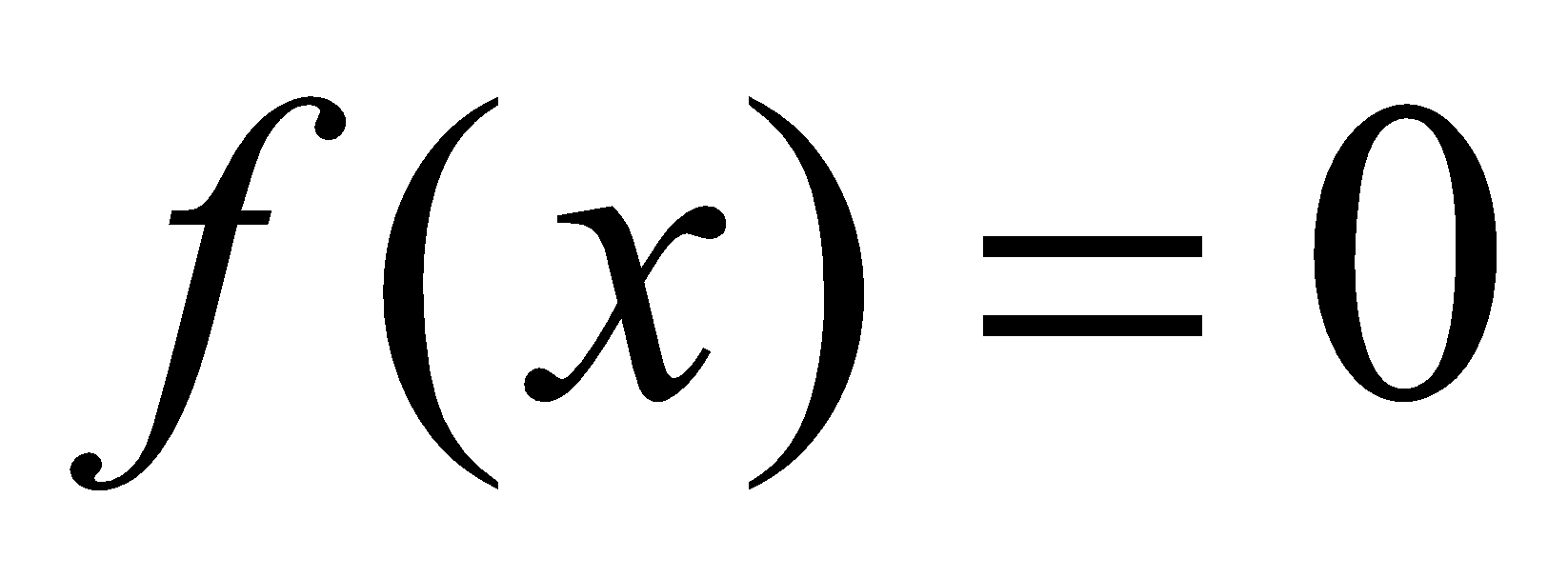
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**(e)**

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**CURVE SKETCHING WITH DERIVATIVES:**

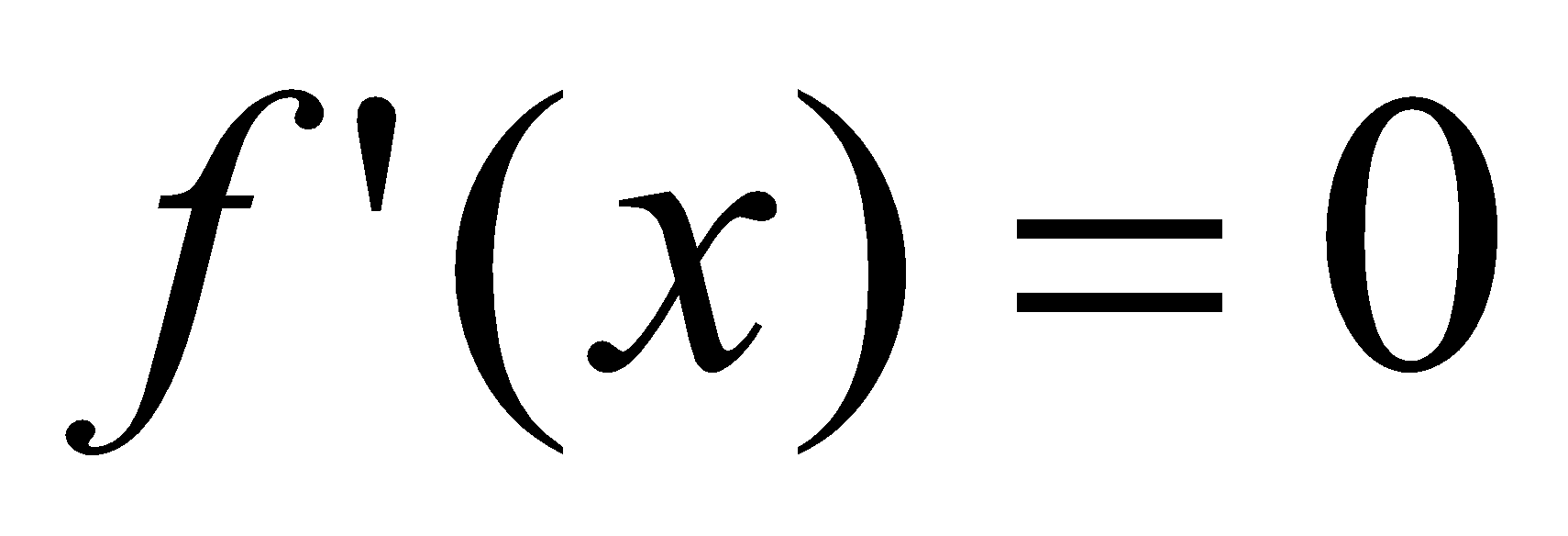
**Important features to note when drawing graphs of derivative functions**

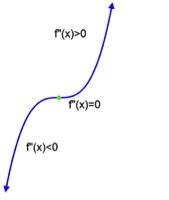
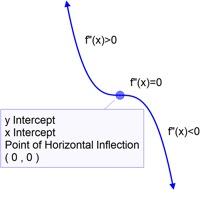
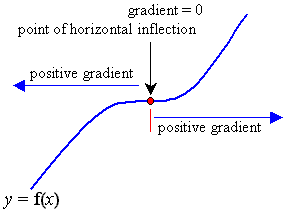
1. ***y* intercept is when *x* is equal to zero. i.e **
2. ***x* – intercept is when *y* is equal to zero**
3. **Sign of the gradient – Positive if the part of the graph is rising from left to right**



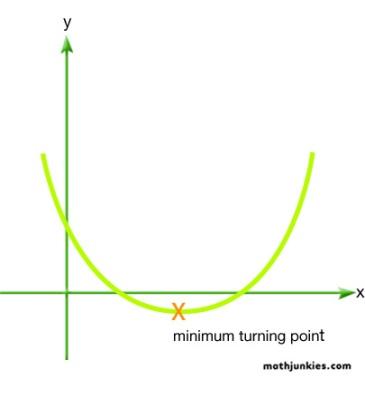
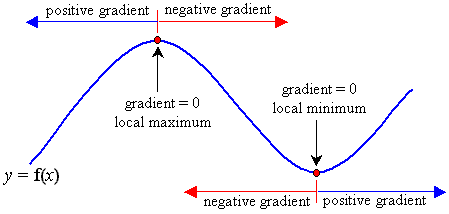
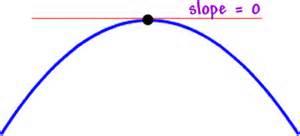
1. **Negative gradient if it is descending from left to right.**

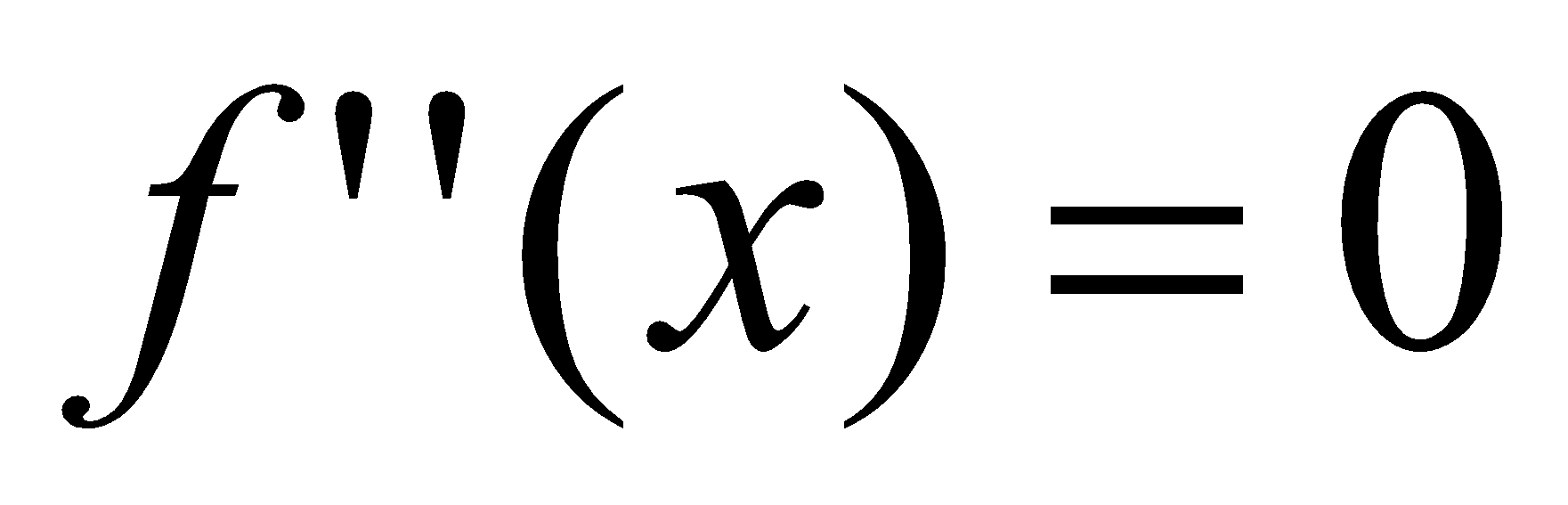
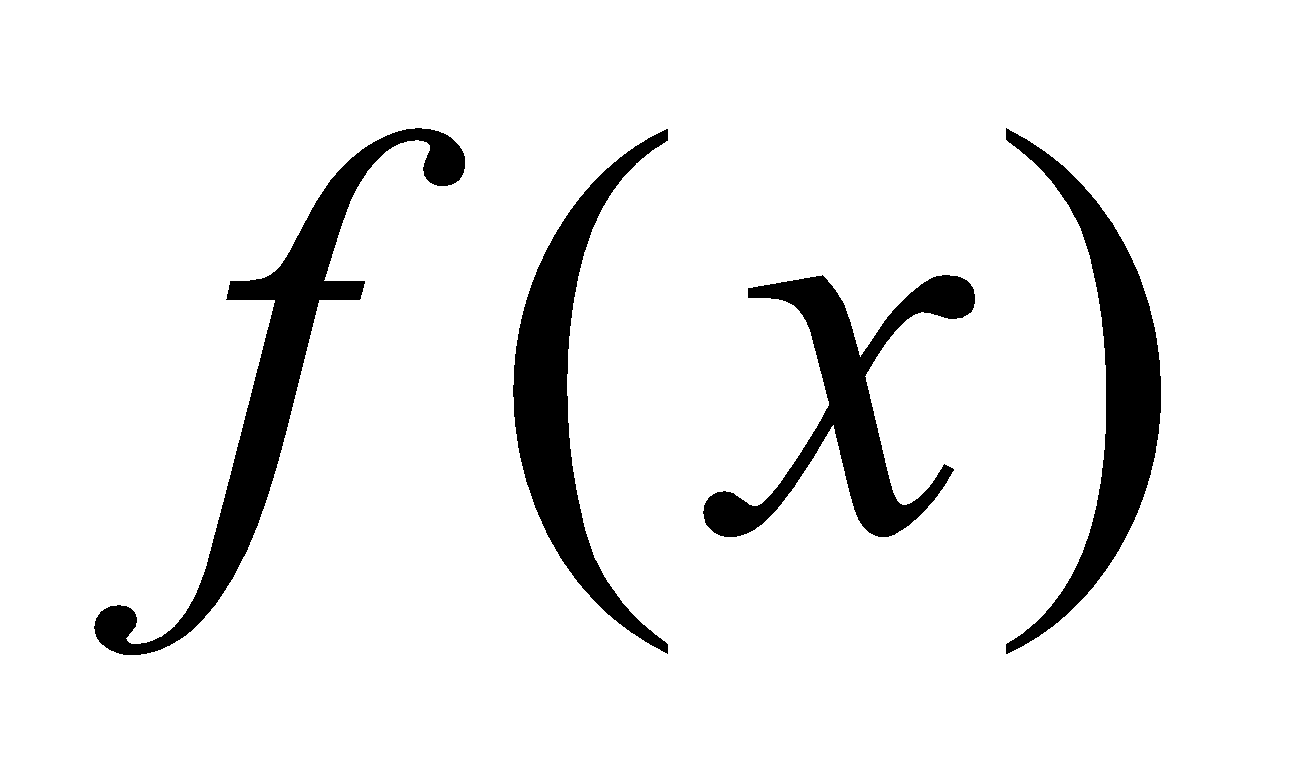
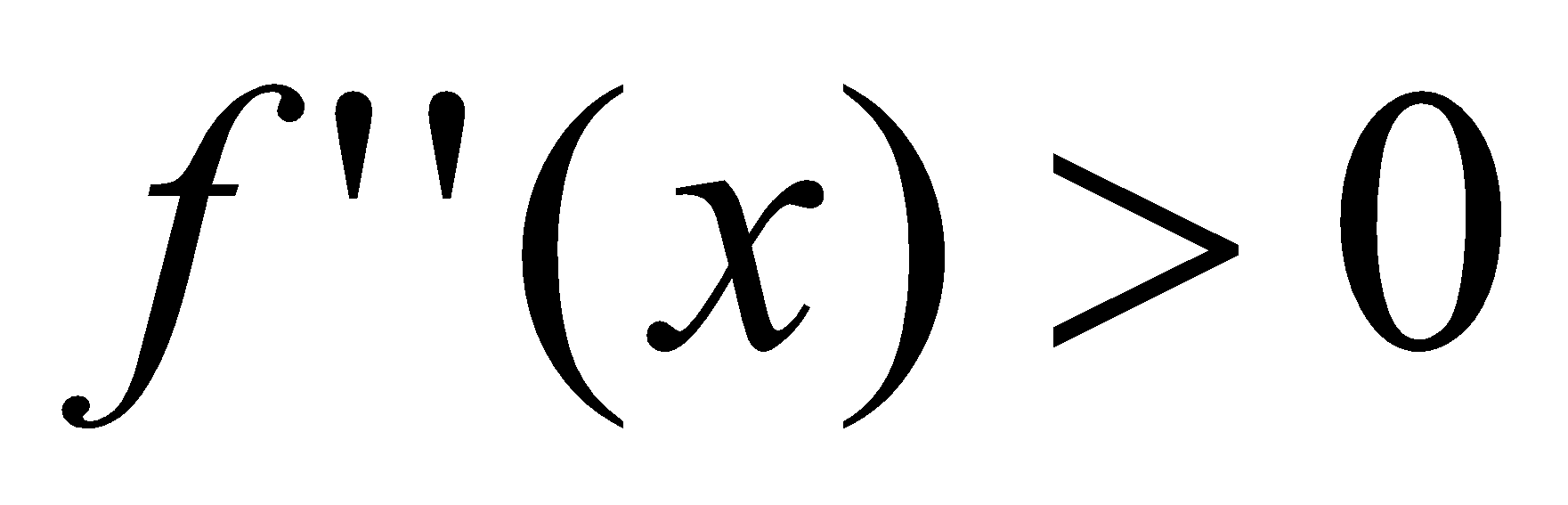


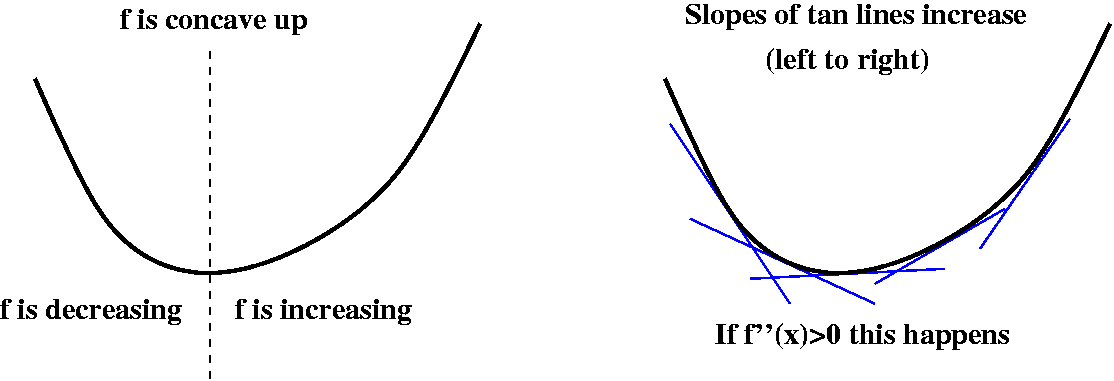
1. **At a point of inflection the second derivative is and gradient = 0 i.e at turning point or point of infection**

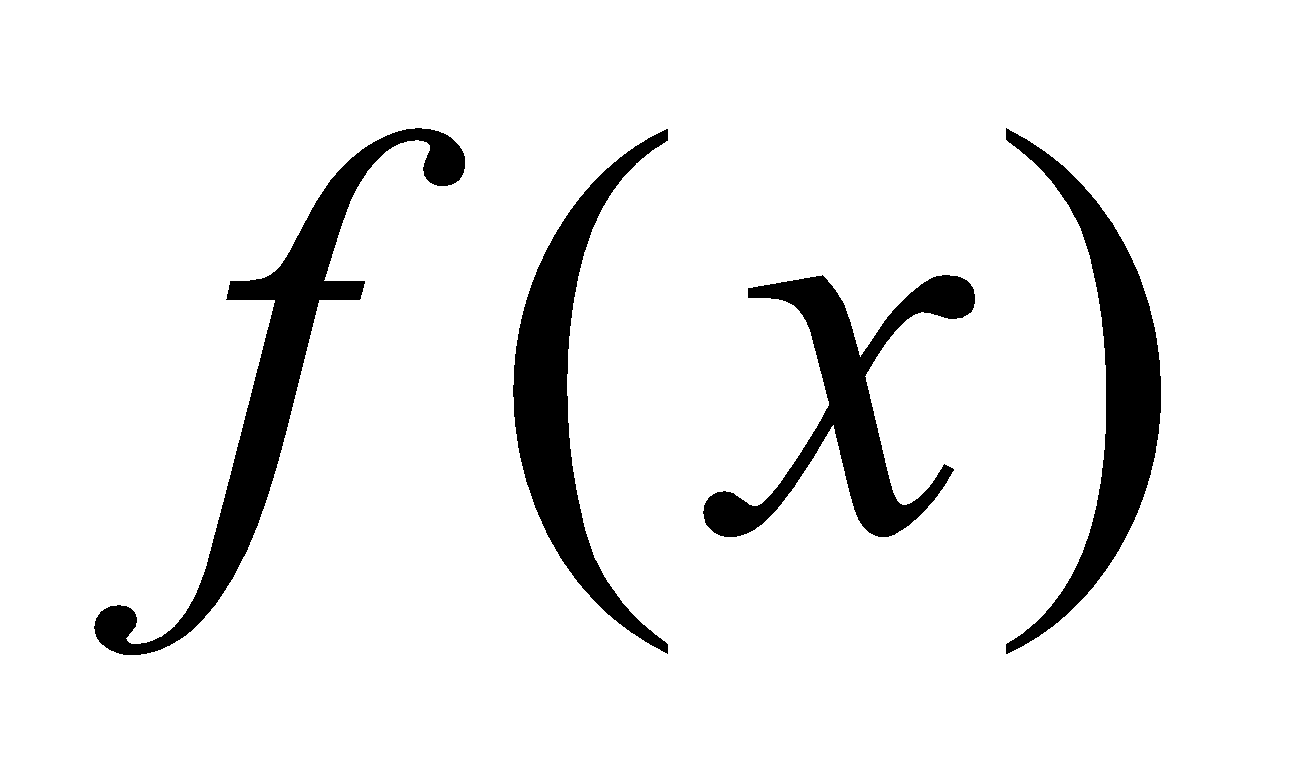
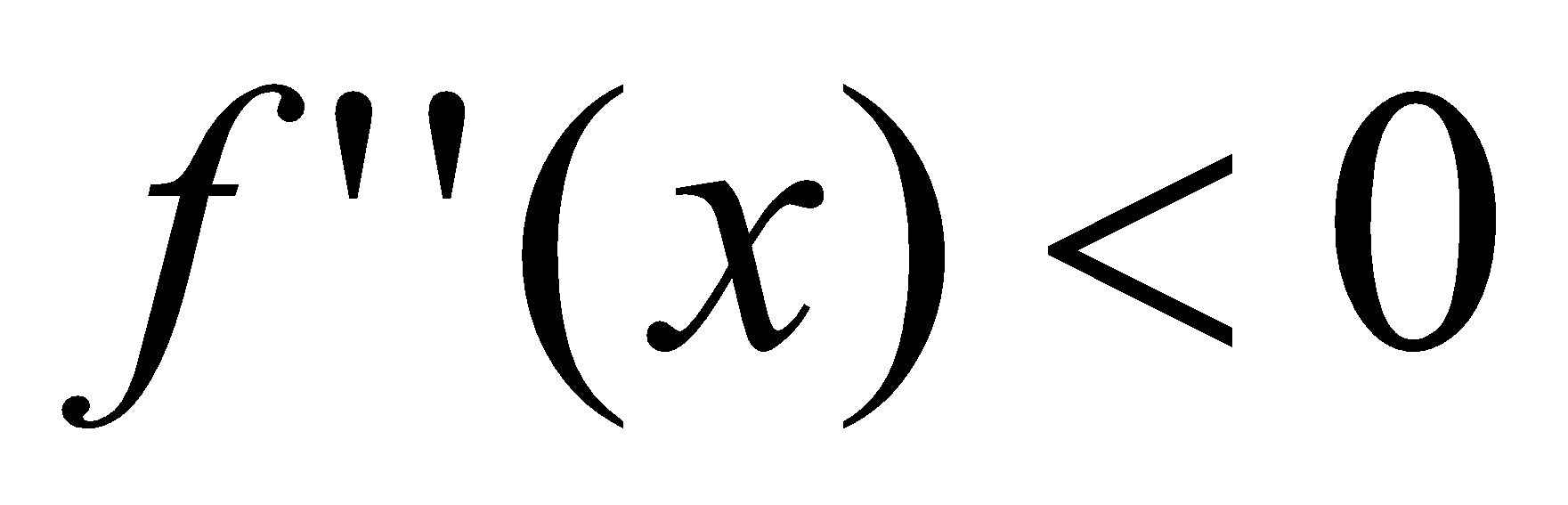
 

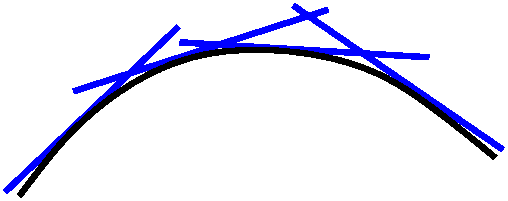
1. **At the turning point the gradient is zero**

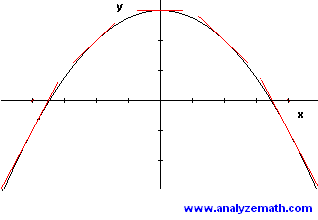


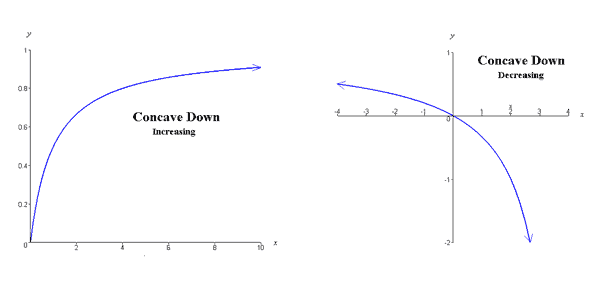
1. **If second derivative is zero, then we have a point of inflection i.e **
2. **If second derivative is greater than zero, then the original graph graph us concave up i.e minimum i.e **

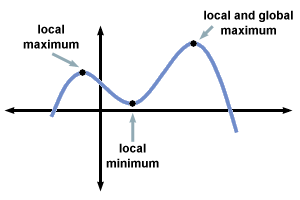


1. **If the second derivative is less than zero then the original graph is concave down i.e i.e maximum**

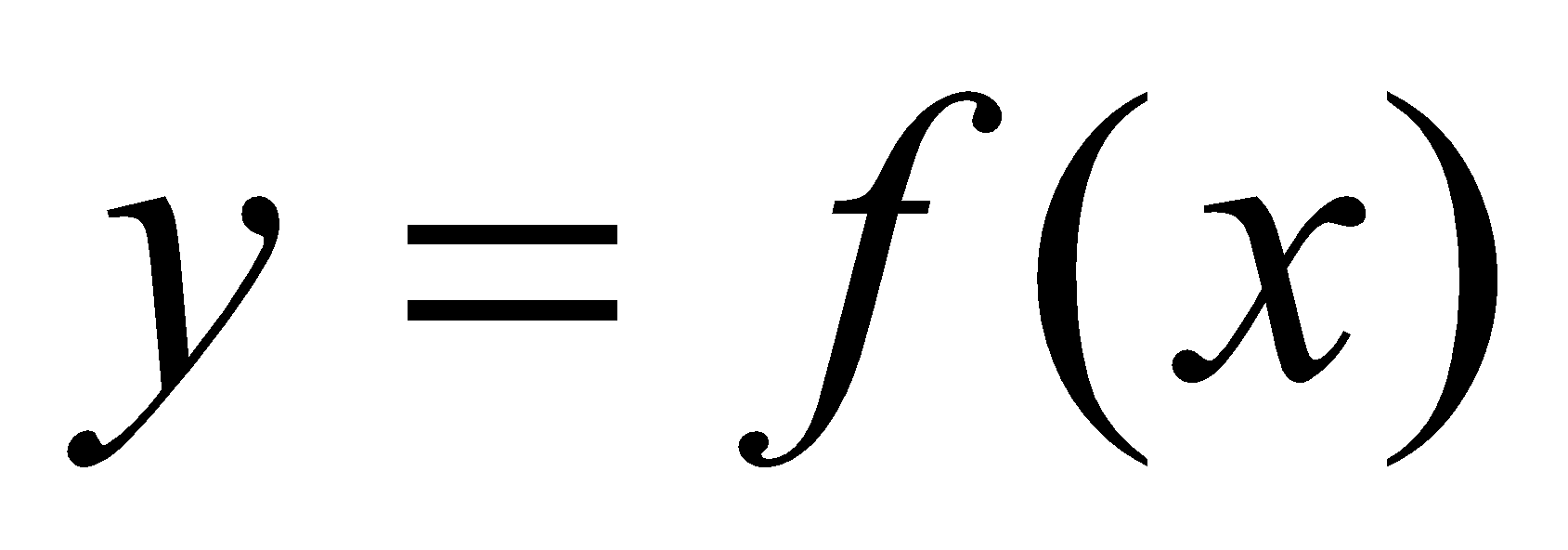
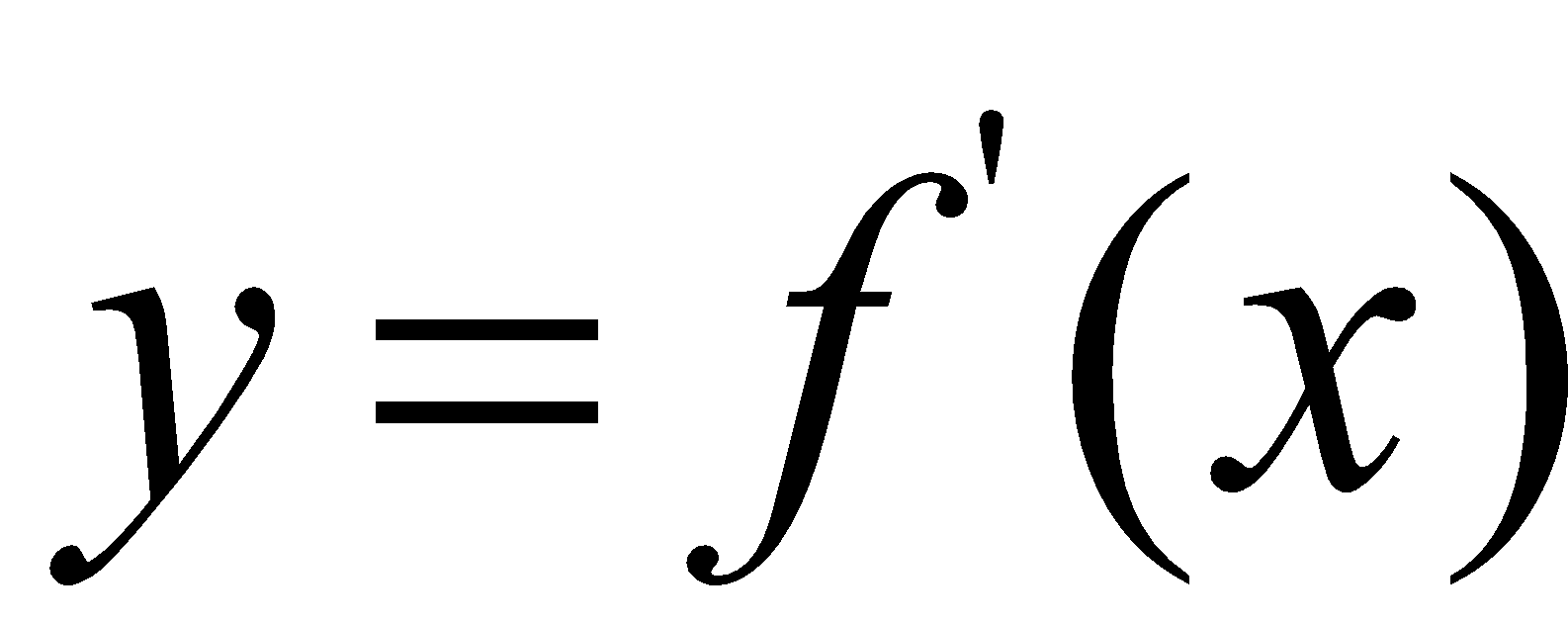


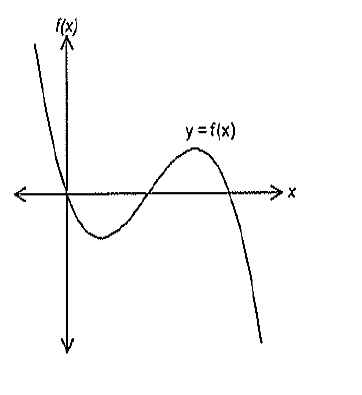




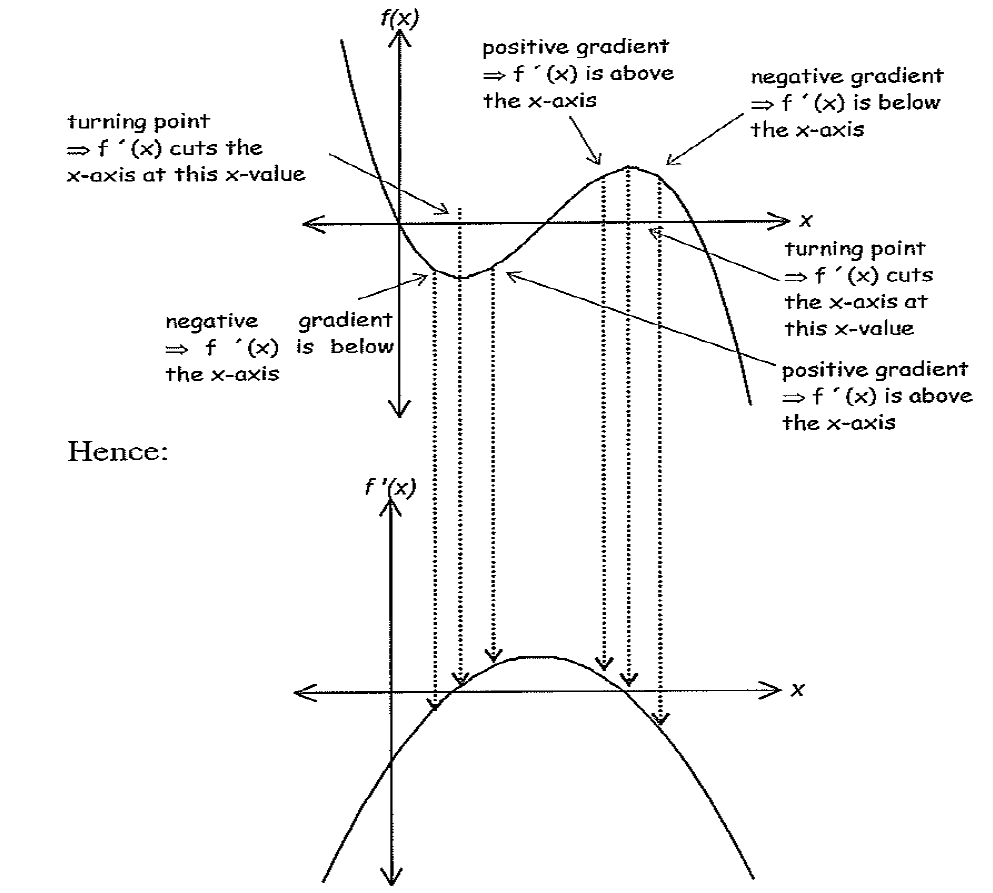


**EXAMPLE**

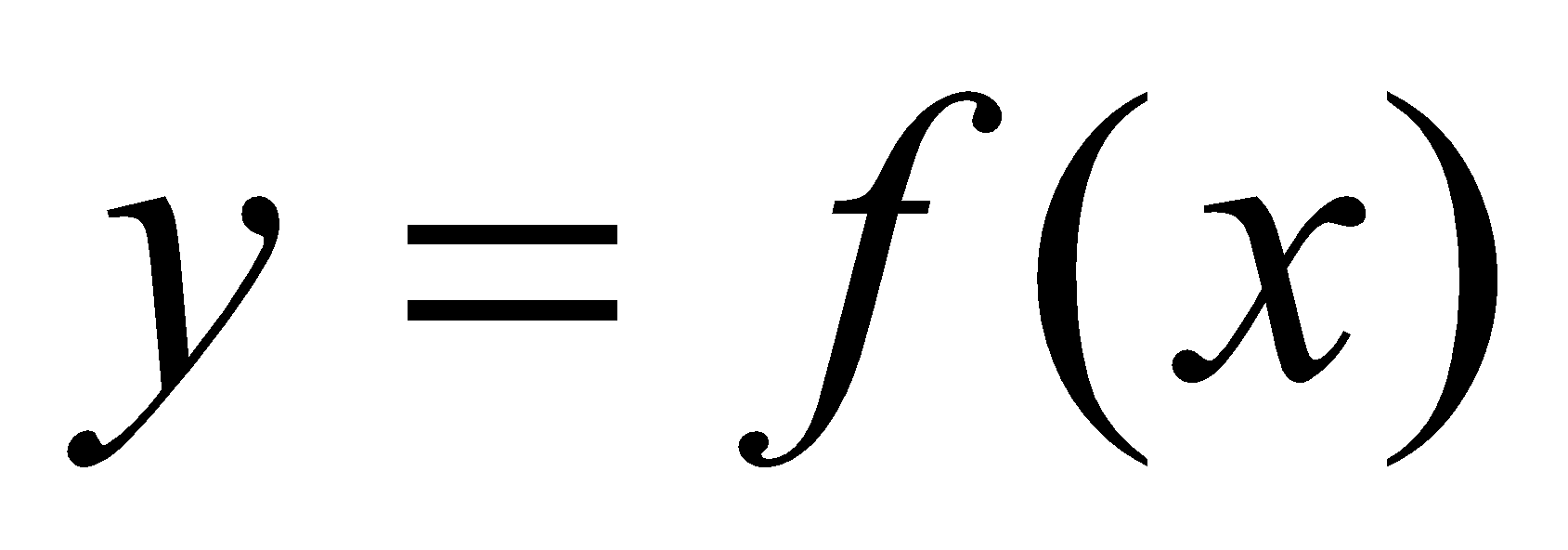
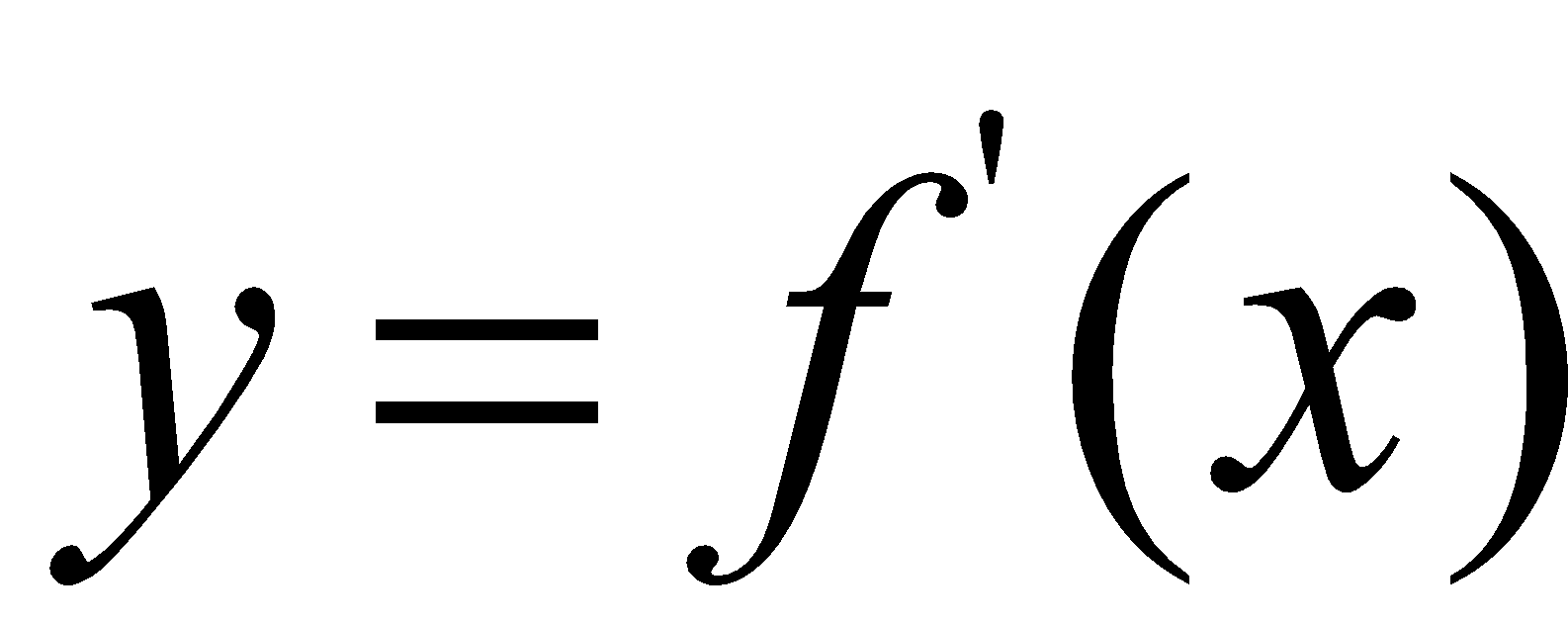
**Given the sketch of** , sketch a possible graph of 

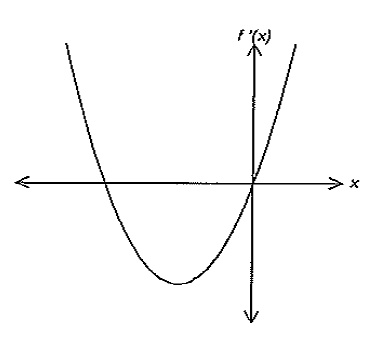
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**Solution:**

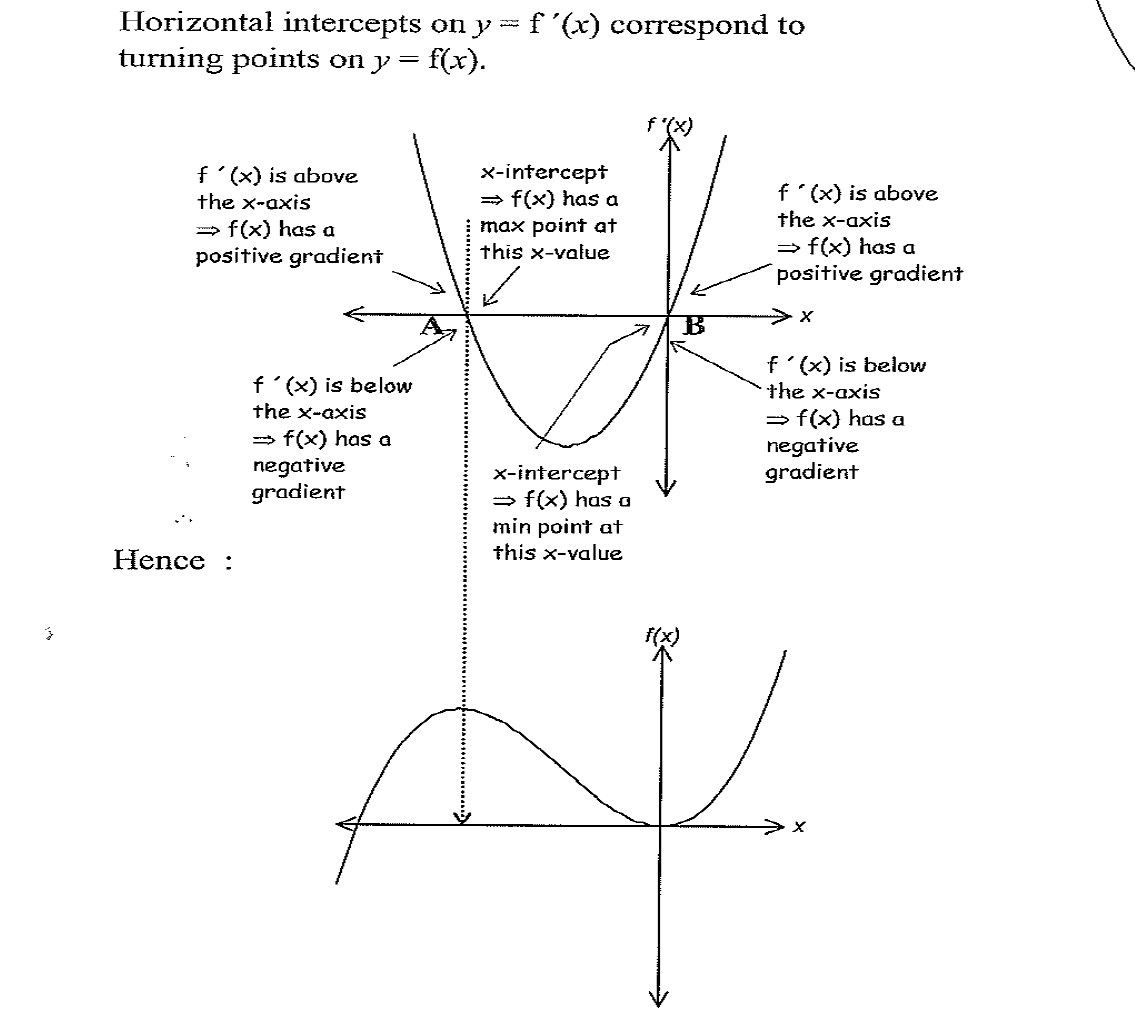
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**EXAMPLE**

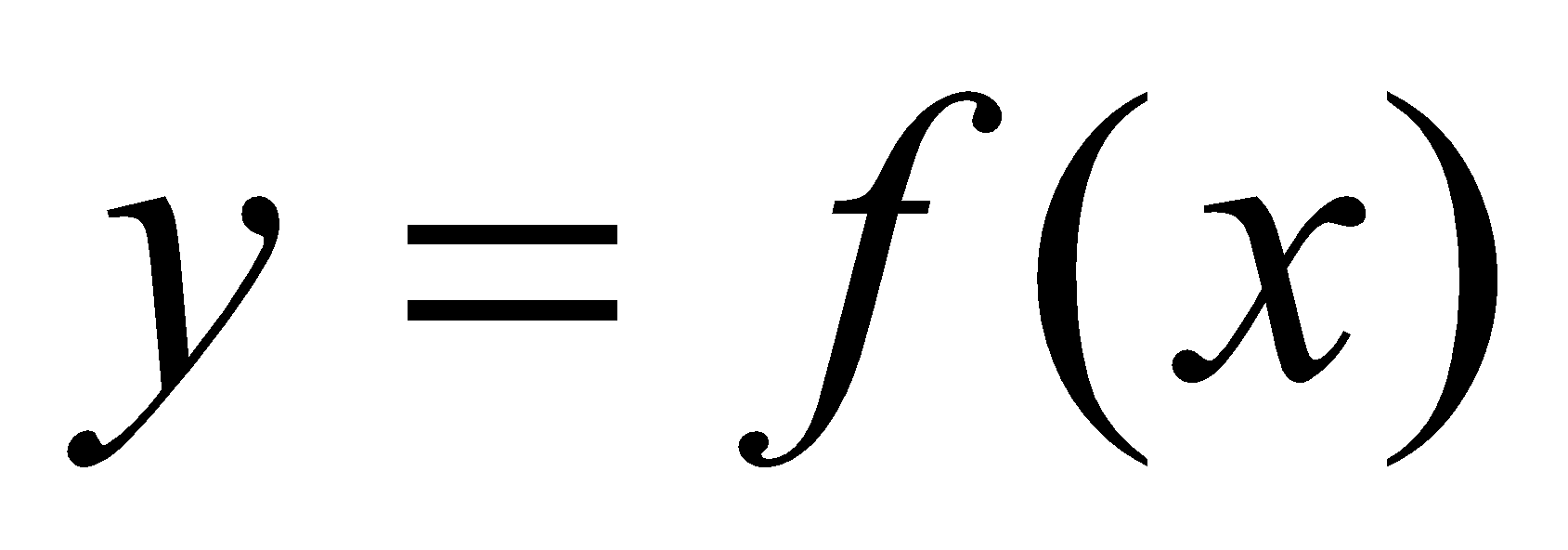
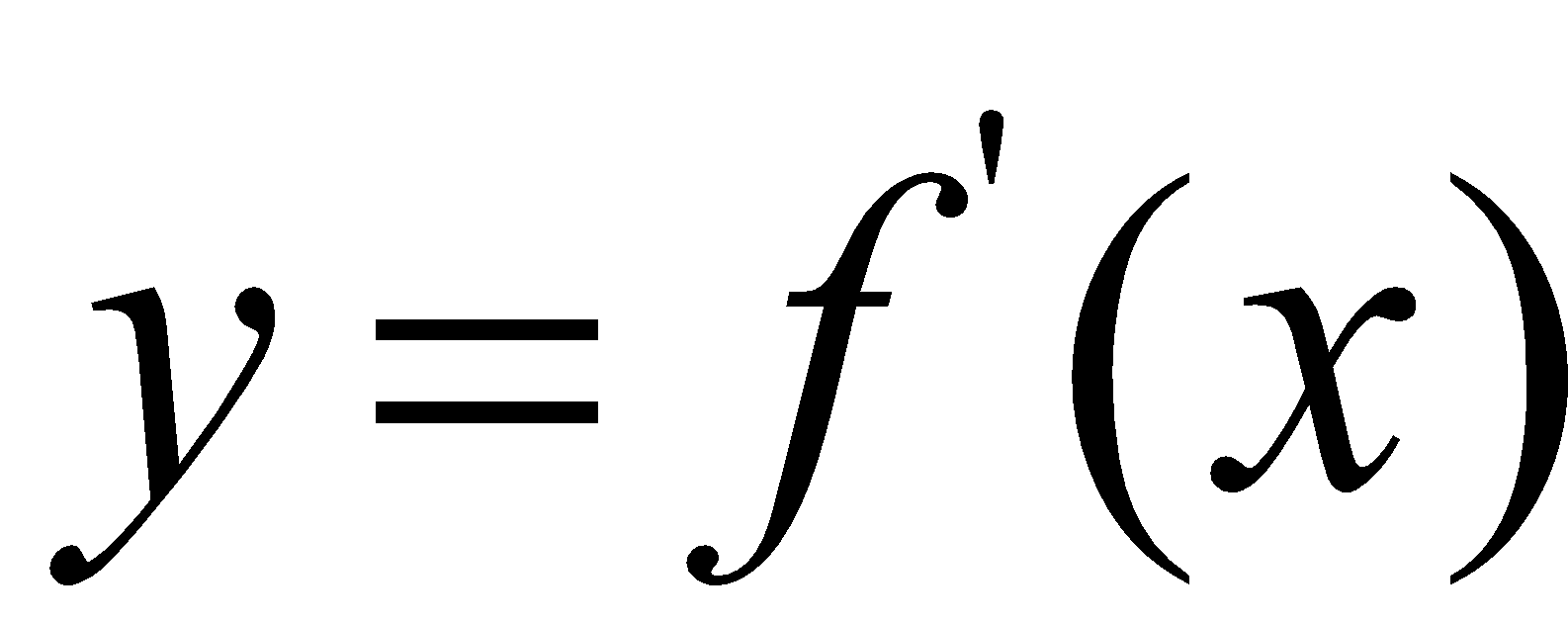
**Given the sketch of** , sketch a possible graph of 

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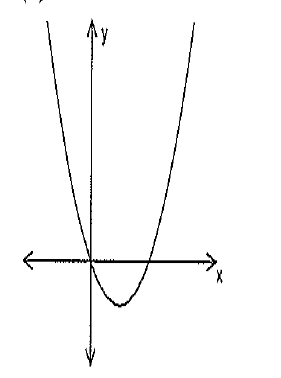
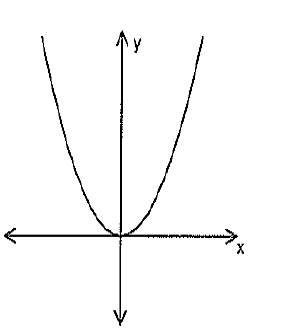
**Solution:**

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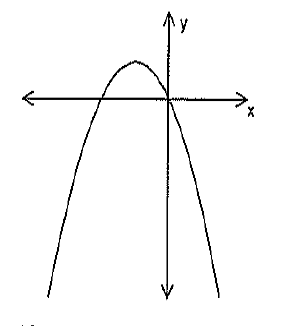
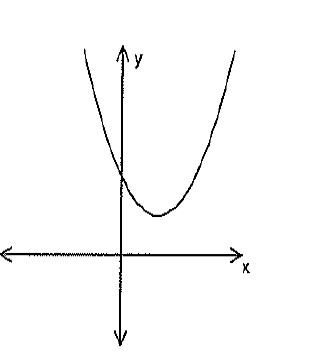
**Question Three:**

**Given the sketch of** , sketch a possible graph of 

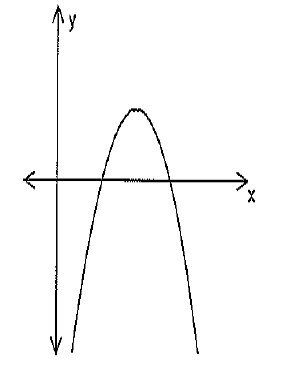
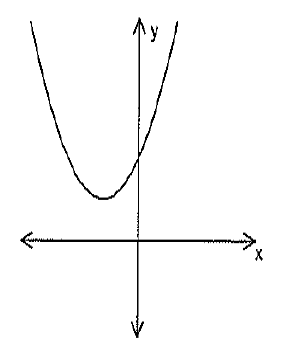
**(a) (b)**

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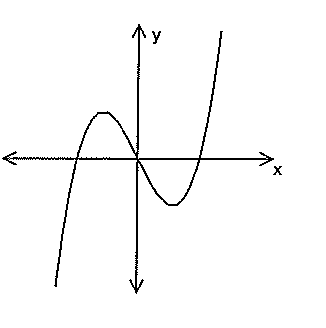
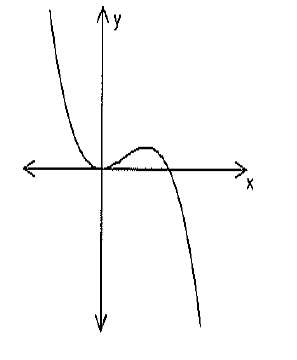
**(c) (d)**

**** ****

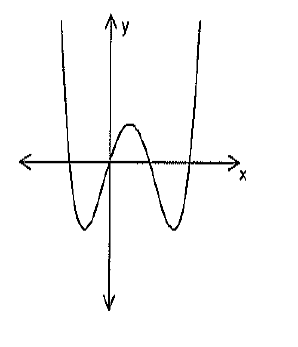
(e) (f)

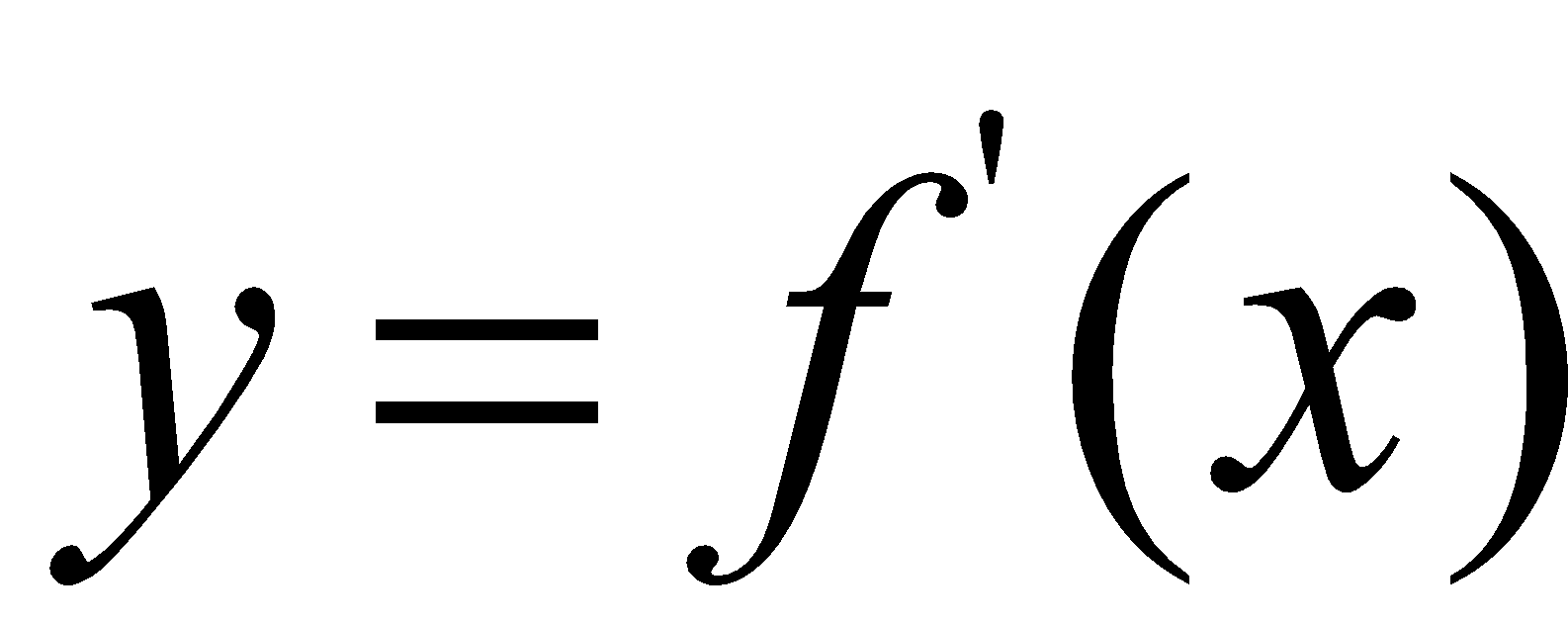
(g) (h)

(i)



**Question Four**

**Given the sketch of** , sketch a possible graph of 