

# Point of Inflection

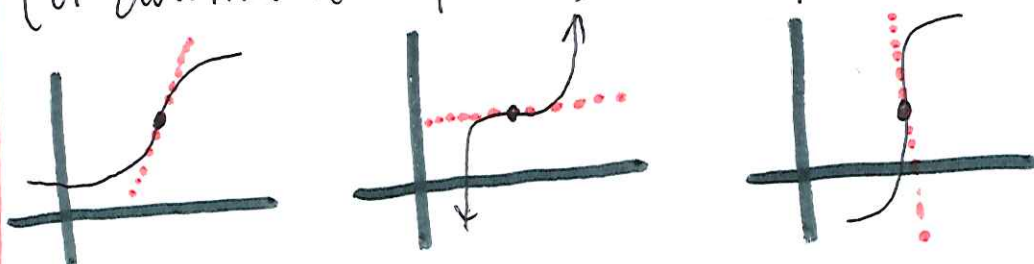
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ES: How do we find points of inflection?

## Definition

If the graph of  $f(x)$  has a **tangent line at the point  $(c, f(c))$**  then this point is a **point of inflection** where the **concavity of  $f(x)$  changes** from upward to downward (or downward to upward) at the point.

(ex)



## Theorem

If  $(c, f(c))$  is a point of inflection, then either  $f''(c) = 0$  or  $f''(c) = \text{DNE}$ .

(ex)

$$f(x) = x^4 - 4x^3$$

(Step 1)  $f'(x) = 4x^3 - 12x^2$

$$f''(x) = 12x^2 - 24x$$

(Step 2)  $0 = 12x^2 - 24x$

$$0 = 12x(x - 2)$$

$12x = 0$   
 $x = 0$

$x - 2 = 0$   
 $x = 2$

(Step 3) Find  $f(c)$

$$f(0) = 0^4 - 4(0)^3$$
$$f(0) = 0$$

$(0, 0)$

$$f(2) = 2^4 - 4(2)^3$$
$$f(2) = -16$$

$(2, -16)$

points of inflection

(Step 4) TABLE

Find the points of inflection

Summary