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IN-CLASS ACTIVITY : GRAPHING AND LOCAL EXTREMA

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1. True or False? Decide whether the following sentences are true or false.
  - i)  $x = 0$  is a local maximum for the function  $f(x) = x^5 + 1$ .
  - ii) Let  $f(x)$  be a polynomial of degree 2. Then  $f(x)$  has no inflection points.
  - iii) There exists a twice differentiable function  $f(x)$  such that  $x = 0$  is both an inflection point and a local minimum.
2. Consider the function  $f(x) = e^{-x} - e^{-3x}$ .
  - i) Find the critical points of  $f(x)$ .
  - ii) Determine the intervals in which the function is increasing and decreasing.
  - iii) Decide whether the critical points are local maxima, local minima or neither.
  - iv) Find the inflection points of  $f(x)$ .
  - v) Determine the intervals where the function is concave-up and concave-down.
  - vi) Sketch the graph of  $f(x)$  in the interval  $[-5, 5]$ .
3. Consider the function  $f(x) = \frac{x-1}{x^2-x-6}$ .
  - i) Indicate at which points  $x_0$  and  $x_1$  the function  $f(x)$  is not continuous.
  - ii) Compute  $\lim_{x \rightarrow x_0^\pm} f(x)$  and  $\lim_{x \rightarrow x_1^\pm} f(x)$ .
  - iii) Find the critical points of  $f(x)$ , if any.
  - iv) Indicate in which intervals the function is increasing and decreasing.
  - v) Sketch the graph of  $f(x)$  in the interval  $[-5, 5]$ .
4. In the next page is the graph of the derivative of a function  $f(x)$ .
  - i) Indicate the critical points of  $f(x)$ .
  - ii) Classify the critical points. (Are they local maxima, local minima or neither?)
  - iii) Find the inflection points of  $f(x)$ .
  - iv) Sketch the graph of  $f''(x)$ .
  - v) Sketch a possible graph for  $f(x)$ .

