

Math 10A. Lecture Examples.

Section 4.1. Using first and second derivatives[†]

Example 1 The function $y = x - 2 \ln x$, whose graph is shown in Figure 1, has a global minimum. Find its value.

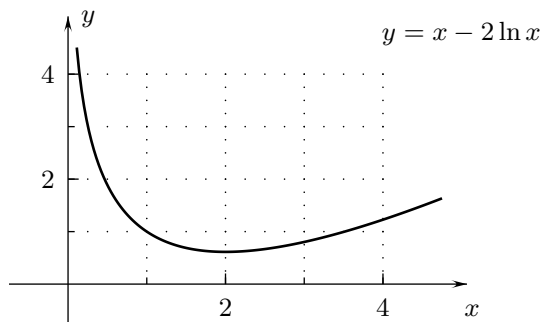


FIGURE 1

Answer: [Global minimum] = $2 - 2 \ln(2)$

Example 2 Find the local maximum and local minimum of $g(x) = x^5 - 5x$. Its graph is in Figure 2.

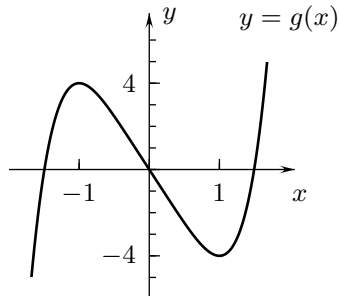


FIGURE 2

Answer: [Local maximum] = 4 • [Local minimum] = -4

[†]Lecture notes to accompany Section 4.1 of *Calculus* by Hughes-Hallett et al.

Answer: $y(x) = 5xe^{-x}$ is increasing on $(-\infty, 1)$ and decreasing on $(1, \infty)$. • (These conclusions are supported by the graph of the function in Figure A3.)

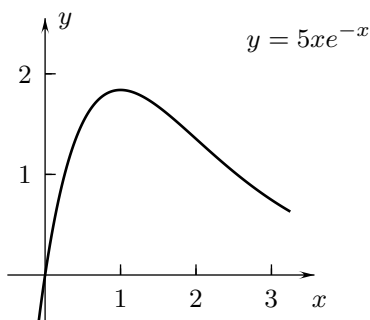


Figure A3

Example 4 (a) Where is the graph of $g(x) = 4x^3 - x^4$ concave up and where is it concave down? (a) What are its inflection points?

Answer: (a) The graph is concave down on $(-\infty, 0)$, concave up on $(0, 2)$, and concave down on $(2, \infty)$.

(b) The inflection points are $(0, 0)$ and $(2, 16)$. • (These conclusions are supported by the graph in Figure A4.)

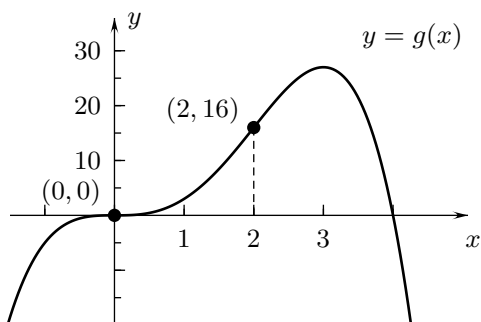


Figure A4

Interactive Examples

Work the following Interactive Examples on Shenk's web page, <http://www.math.ucsd.edu/~ashenk/>.[‡]

Section 4.1: Examples 1, 2, and 3

Section 4.2: Examples 1 and 2

Section 4.3: Examples 1 through 4

[‡]The chapter and section numbers on Shenk's web site refer to his calculus manuscript and not to the chapters and sections of the textbook for the course.