

A. P. Calculus
Problem Set 1
Due 3/6/2019

No Calculator

Let f be the function that is defined for all real numbers x and that has the following properties.

(i) $f''(x) = 24x - 18$ (ii) $f'(1) = -6$ (iii) $f(2) = 0$

- (a) Find each x such that the line tangent to the graph of f at $(x, f(x))$ is horizontal.
- (b) Write an expression for $f(x)$.
- (c) Find the average value of f on the interval $1 \leq x \leq 3$.

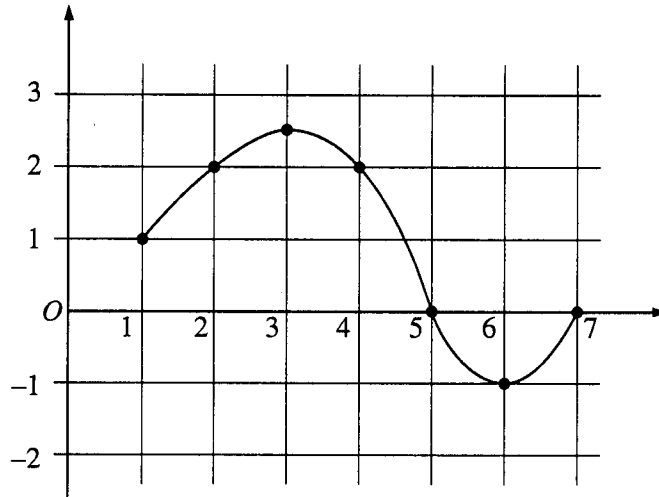
No Calculator

Let f be a function that is even and continuous on the closed interval $[-3, 3]$. The function f and its derivatives have the properties indicated in the table below.

x	0	$0 < x < 1$	1	$1 < x < 2$	2	$2 < x < 3$
$f(x)$	1	Positive	0	Negative	-1	Negative
$f'(x)$	Undefined	Negative	0	Negative	Undefined	Positive
$f''(x)$	Undefined	Positive	0	Negative	Undefined	Negative

- (a) Find the x -coordinate of each point at which f attains an absolute maximum value or an absolute minimum value. For each x -coordinate you give, state whether f attains an absolute maximum or an absolute minimum.
- (b) Find the x -coordinate of each point of inflection on the graph of f . Justify your answer.
- (c) Sketch the graph of a function with all the given characteristics of f .

Graphing Calculator



The graph of a differentiable function f on the closed interval $[1, 7]$ is shown above.

Let $h(x) = \int_1^x f(t) dt$ for $1 \leq x \leq 7$.

- Find $h(1)$.
- Find $h'(4)$.
- On what interval or intervals is the graph of h concave upward? Justify your answer?
- Find the value of x at which h has its minimum on the closed interval $[1, 7]$. Justify your answer.

A highway patrol plane flies one mile above a straight section of rural interstate highway at a steady ground speed of 120 miles per hour. The pilot sees an oncoming car and, with radar, determines that the **line-of-sight** distance from the plane to the car is 1.5 miles and that this distance is decreasing at a rate of 136 miles per hour. Should the driver of the car be given a ticket for speeding? Tell it to the judge. (Assume the judge knows calculus.)