

1979 AB2

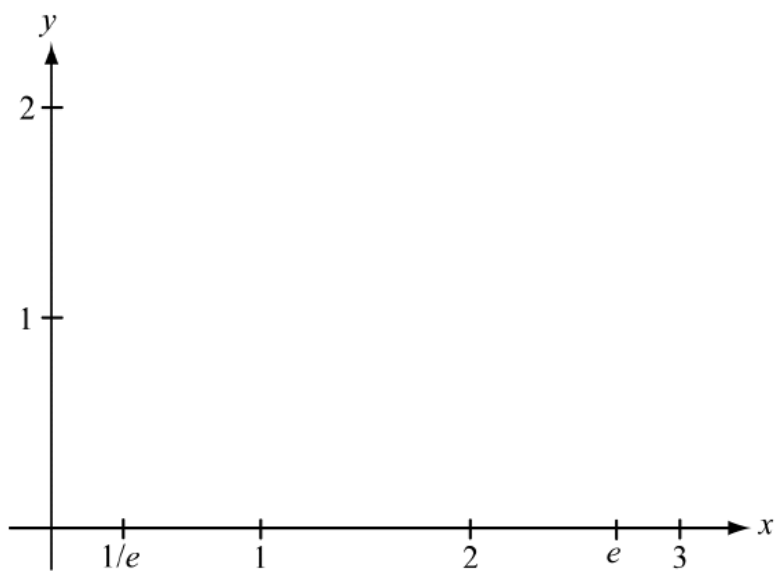
A function f is defined by $f(x) = xe^{-2x}$ with domain $0 \leq x \leq 10$.

- (a) Find all values of x for which the graph of f is increasing and all values of x for which the graph is decreasing.
- (b) Give the x - and y -coordinates of all absolute maximum and minimum points on the graph of f . Justify your answers.

1969 AB3

Given $f(x) = \frac{1}{x} + \ln x$, defined only on the closed interval $\frac{1}{e} \leq x \leq e$.

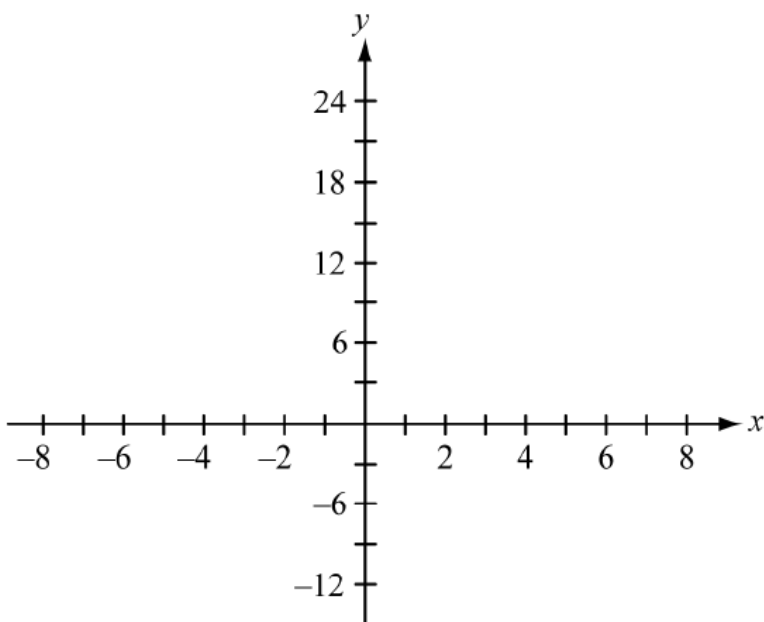
- (a) Showing your reasoning, determine the value of x at which f has its
- (i) absolute maximum,
 - (ii) absolute minimum.
- (b) For what values of x is the curve concave up?
- (c) On the coordinate axes provided, sketch the graph of f over the interval $\frac{1}{e} \leq x \leq e$.



1970 AB3

Consider the function f given by $f(x) = x^{\frac{4}{3}} + 4x^{\frac{1}{3}}$ on the interval $-8 \leq x \leq 8$.

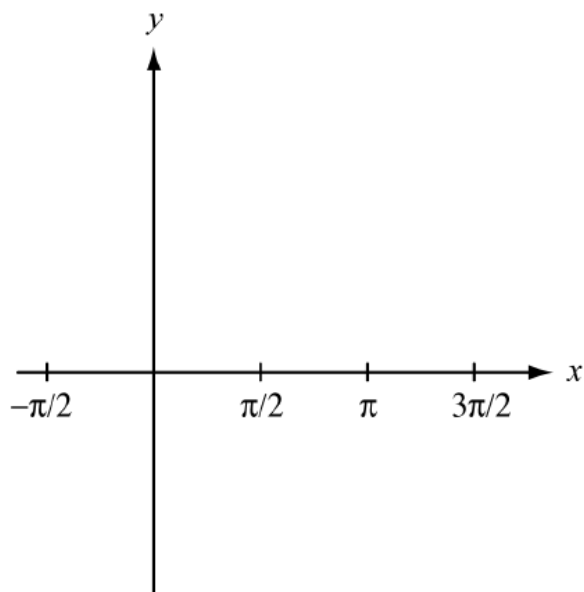
- (a) Find the coordinates of all points at which the tangent to the curve is a horizontal line.
- (b) Find the coordinates of all points at which the tangent to the curve is a vertical line.
- (c) Find the coordinates of all points at which the absolute maximum and absolute minimum occur.
- (d) For what values of x is this function concave down?
- (e) On the axes provided, sketch the graph of the function on this interval.



1975 AB4

Given the function defined by $y = x + \sin x$ for all x such that $-\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$.

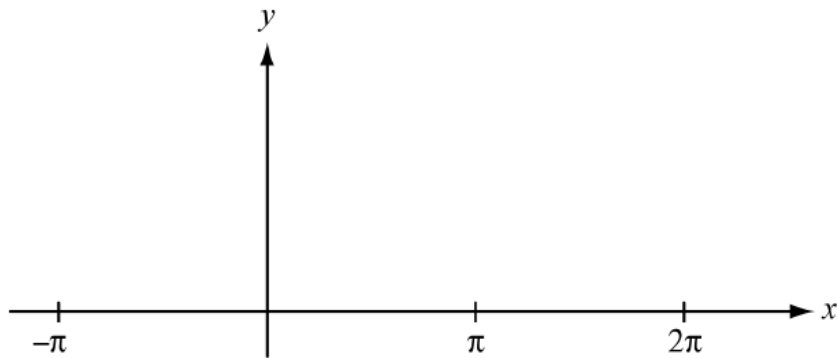
- (a) Find the coordinates of all maximum and minimum points on the given interval. Justify your answers.
- (b) Find the coordinates of all points of inflection on the given interval. Justify your answers.
- (c) On the axes provided, sketch the graph of the function.
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1976 AB5

Given the function defined by $y = e^{\sin x}$ for all x such that $-\pi \leq x \leq 2\pi$.

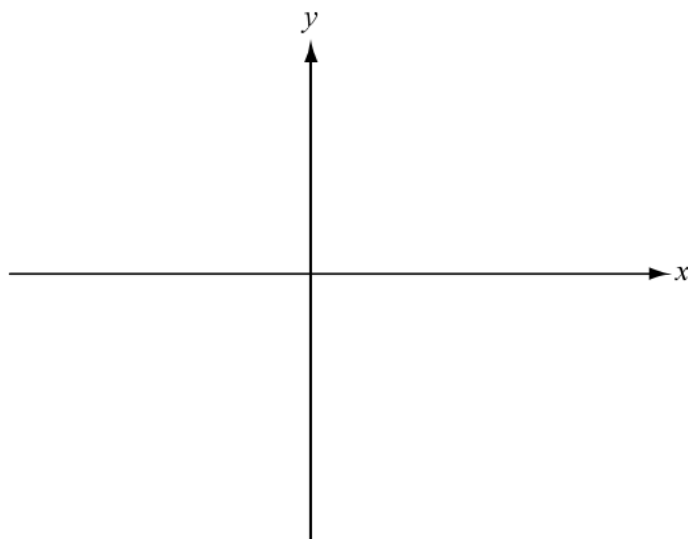
- (a) Find the x - and y -coordinates of all maximum and minimum points on the given interval. Justify your answers.
- (b) On the axes provided, sketch the graph of the function.
- (c) Write an equation for the axis of symmetry of the graph.



1977 AB2

Consider the function f defined by $f(x) = (x^2 - 1)^3$ for all real numbers x .

- (a) For what values of x is the function increasing?
- (b) Find the x - and y -coordinates of the relative maximum and minimum points. Justify your answer.
- (c) For what values of x is the graph of f concave upward?
- (d) Using the information found in parts (a), (b), and (c), sketch the graph of f on the axes provided.

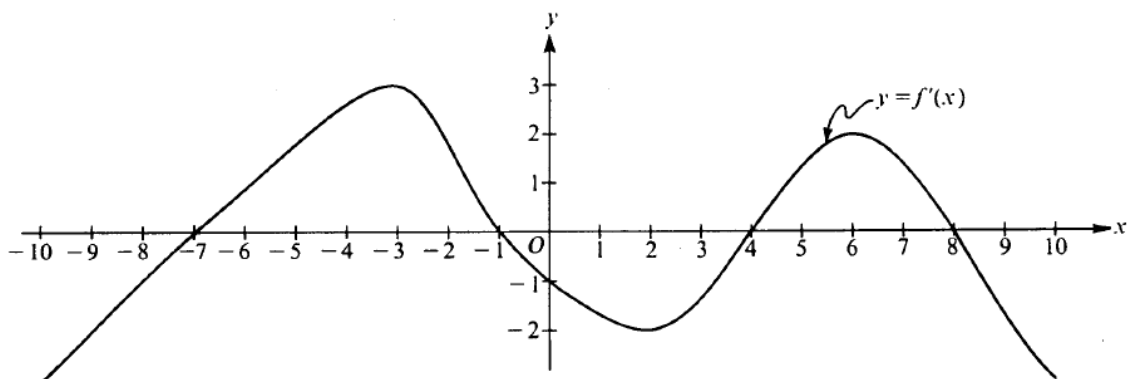


1989 AB1

Let f be the function given by $f(x) = x^3 - 7x + 6$.

- (a) Find the zeros of f .
- (b) Write an equation of the line tangent to the graph of f at $x = -1$.
- (c) Find the number c that satisfies the conclusion of the Mean Value Theorem for f on the closed interval $[1, 3]$.

1989 AB5



Note: This is the graph of the derivative of f , not the graph of f .

The figure above shows the graph of f' , the derivative of a function f . The domain of f is the set of all real numbers x such that $-10 \leq x \leq 10$.

- (a) For what values of x does the graph of f have a horizontal tangent?
- (b) For what values of x in the interval $(-10, 10)$ does f have a relative maximum?
Justify your answer.
- (c) For value of x is the graph of f concave downward?

1989 BC3

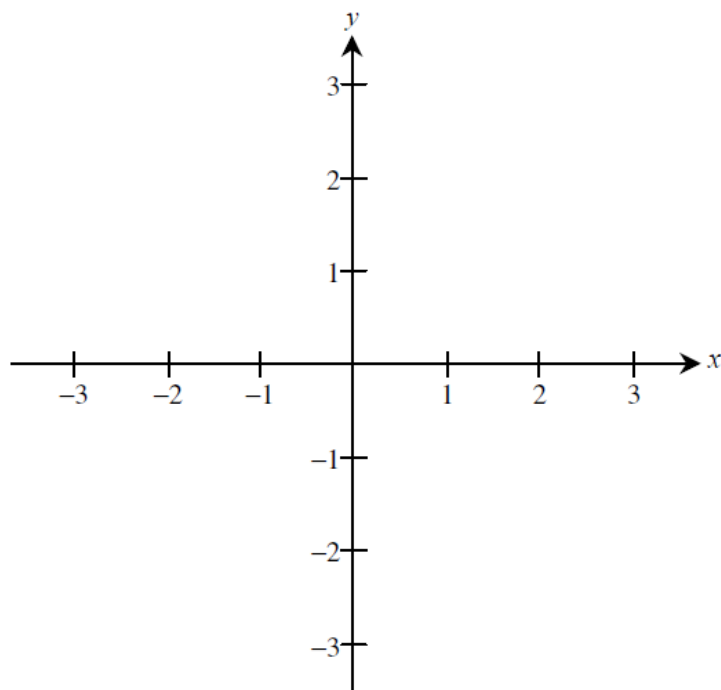
Consider the function f defined by $f(x) = e^x \cos x$ with domain $[0, 2\pi]$.

- (a) Find the absolute maximum and minimum values of $f(x)$.
- (b) Find the intervals on which f is increasing.
- (c) Find the x -coordinate of each point of inflection of the graph of f .

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

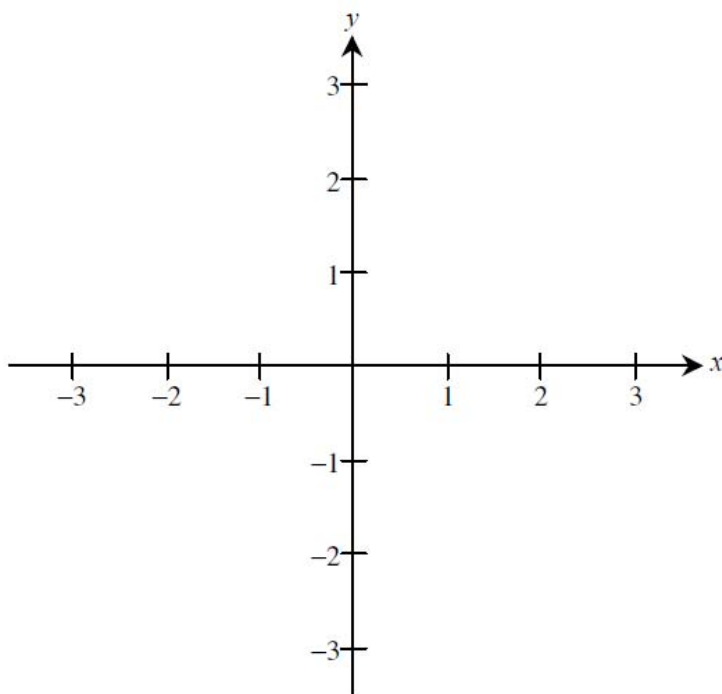
- (a) Find the x -coordinate of each point at which f attains an absolute maximum value or an absolute minimum value. For each x -coordinate you give, state whether f attains an absolute maximum or an absolute minimum.
- (b) Find the x -coordinate of each point of inflection on the graph of f . Justify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



1991 BC2

Let f be the function defined by $f(x) = xe^{1-x}$ for all real numbers x .

- Find each interval on which f is increasing.
- Find the range of f .
- Find the x -coordinate of each point of inflection of the graph of f .
- Using the results found in parts (a), (b), and (c), sketch the graph of f in the xy -plane provided below. (Indicate all intercepts.)



1992 AB1

Let f be the function defined by $f(x) = 3x^5 - 5x^3 + 2$.

- (a) On what intervals is f increasing?
- (b) On what intervals is the graph of f concave upward?
- (c) Write the equation of each horizontal tangent line to the graph of f .

1992 BC4

Let f be a function defined by $f(x) = \begin{cases} 2x - x^2 & \text{for } x \leq 1, \\ x^2 + kx + p & \text{for } x > 1. \end{cases}$

- (a) For what values of k and p will f be continuous and differentiable at $x = 1$?
- (b) For the values of k and p found in part (a), on what interval or intervals is f increasing?
- (c) Using the values of k and p found in part (a), find all points of inflection of the graph of f . Support your conclusion.