

1. AP 1977 – AB 2

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

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

2. AP 1981 – AB 3, BC 1

Let f be the function defined by $f(x) = 12x^{2/3} - 4x$

- a. Find the intervals on which f is increasing.
- b. Find the x - and y - coordinates of all relative maximum points.
- c. Find the x - and y - coordinates of all relative minimum points.
- d. Find the intervals on which f is concave downward.
- e. Using the information found in parts (a), (b), (c), and (d) sketch the graph of f .

3. **AP 1986 – AB 1**

Let f be the function defined by $f(x) = 7 - 15x + 9x^2 - x^3$ for all real numbers, x .

- a. Find the zeros f .
- b. Write an equation of tangent to the graph of f at $x = 2$.
- c. Find the x -coordinates of all points of inflection of f . Justify your answer.

4. **AP 1986 – AB 2**

Let f be the function defined by $f(x) = \frac{9x^2 - 36}{x^2 - 9}$

- a. Describe the symmetry of the graph of f .
- b. Write an equation for each vertical and each horizontal asymptote of f .
- c. Find the intervals on which f is increasing.
- d. Using the results found in parts (a), (b), and (c) sketch the graph of f .

5. **AP 1978 – BC 2**

Given the function f defined by $f(x) = x|x + 2|$ for all x such that $-3 \leq x \leq 1$

- a. Find the values of x in the given interval for which f is increasing. Justify your answer.
- b. For what values of x is the graph of f concave downward?
- c. Sketch the graph of f .
- d. Is $f'(x)$ continuous for all x in the given interval? Justify your answer.

6. AP 1980 – AB 5, BC 2

Given the function f defined by $f(x) = \cos x - \cos^2 x$ for $-\pi \leq x \leq \pi$

- a. Find the x -intercepts of the graph of f .
- b. Find the x - and y - coordinates of all relative maximum points. Justify your answer.
- c. Find the intervals on which the graph of f is increasing.
- d. Using the results found in parts (a), (b), and (c) sketch the graph of f .

7. **AP 1983 – AB 3, BC 1**

Let f be the function defined for $\frac{\pi}{6} \leq x \leq \frac{5\pi}{6}$ by $f(x) = x + \sin^2 x$

- a. Find all values of x for which $f'(x) = 1$.
- b. Find all x -coordinates of all relative minimum points of f . Justify your answer.
- c. Find all x -coordinates of all inflection points of f . Justify your answer.

8. **AP 1990 – AB 5**

Let f be the function defined by $f(x) = \sin^2 x - \sin x$ for $0 \leq x \leq \frac{3\pi}{2}$

- a. Find the x -intercepts of the graph of f .
- b. Find the intervals on which f is increasing.
- c. Find the absolute maximum value and the absolute minimum value of f .
Justify your answer.