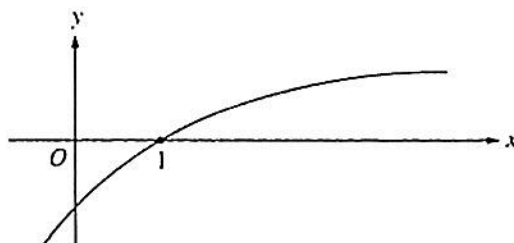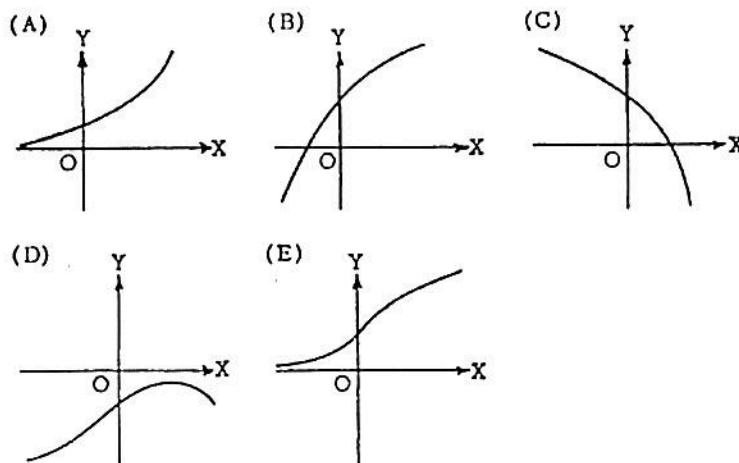1. If y is a function of x such that $y' > 0$ for all x and $y'' < 0$ for all x, which of the following could be part of the graph of $y = f(x)$?

(A)

(B)

(C)

(D)

(E)

2. The graph of a twice-differentiable function f is shown in the figure above. Which of the following is true?

   (A) $f(1) < f'(1) < f''(1)$

   (B) $f(1) < f''(1) < f'(1)$

   (C) $f'(1) < f(1) < f''(1)$

   (D) $f''(1) < f(1) < f'(1)$

   (E) $f''(1) < f'(1) < f(1)$
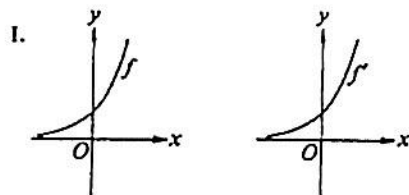
3. What are all values of x for which the function f defined by $f(x) = (x^2 - 3)e^{-x}$ is increasing?

   (A) There are no such values of x.

   (B) $x < -1$ and $x > 3$

   (C) $-3 < x < 1$

   (D) $-1 < x < 3$

   (E) All values of x

4. The graph of $y = \dfrac{-5}{x-2}$ is concave downward for all values of x such that

(A) $x < 0$ (B) $x < 2$ (C) $x < 5$ (D) $x > 0$ (E) $x > 2$

5. Which of the following pairs of graphs could represent the graph of a function and the graph of its derivative?

I.

II.

III.
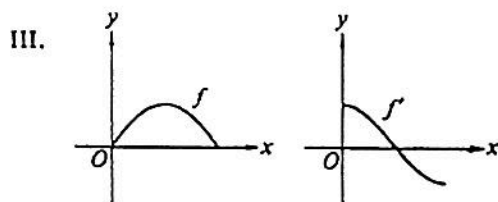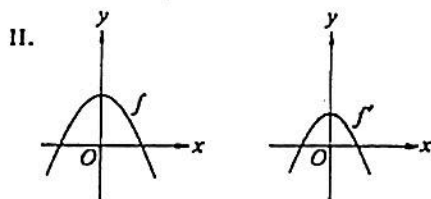
(A) I only   (B) II only   (C) III only   (D) I and III   (E) II and III

6. Let $f(x) = x \ln x$. The minimum value attained by f is

(A) $-\dfrac{1}{e}$

(B) 0

(C) $\dfrac{1}{e}$

(D) -1

(E) There is no minimum.

7. What is the x-coordinate of the point of inflection on the graph of $y = \dfrac{1}{3}x^3 + 5x^2 + 24$?
Write an equation for the _normal_ line to the curve at its point of inflection

(A) 5   (B) 0   (C) $-\dfrac{10}{3}$ (D) -5 (E) -10

1980 AB 5

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

(a) Find the x-intercepts of the graph of f.

(b) Find the x- and y-coordinates of all relative maximum points of f. Justify your answer.

(c) Find the intervals on which the graph of f is increasing.

(d) Using the information found in parts (a), (b), and (c), sketch the graph of f on the axes provided.