1. Find the minimum value of the function $f(x) = x^2 - 4x + 1$

A) –8 B) –4 C) –3 D) 2 E) 3

2. In which one of the following intervals is the function $f(x) = x^3 - 3x^2 + 1$ decreasing?

A) (∞,0) B) (0,2) C) (0,1)
D) (–2,0) E) (2,+∞)

3. What is the minimum value of the function $f(x) = 2x^3 - 3x^2 - 12x + 1$ in the interval [0,3] ?

A) -19 B) -17 C) -13 D) 8 E) 9

4. Find the coordinates of the point at which the function $f(x) = x^3 + 2x^2 - 4x + 3$ takes its' maximum

A) (–2,11) B) (–1,8) C) (3,6)
D) (2,10) E) $(-2, \frac{2}{3})$

5. If the function $f(x) = mx^3 + (m-6)x^2 + 3mx$ has a maximum at $x = \frac{1}{3}$, find the value of m

A) 1 B) 2 C) 3 D) $\frac{1}{2}$ E) $\frac{3}{2}$

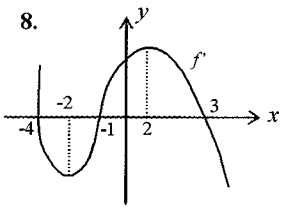
6. If the function $f : \Re \to \Re \quad f(x) = -x^3 + mx^2 + nx$ has a local maximum at (2,4), find m.

A) 0 B) 1 C) 3 D) 4 E) 5

7. The function f is defined as $f : [0, 2\pi] \to \Re$, $f(x) = \frac{1}{2}\sin 2x + \cos x$. Find the interval where the function decreases.

A) $\frac{\pi}{6} < x < \frac{\pi}{2}$ B) $\frac{5\pi}{6} < x < \frac{3\pi}{2}$
C) $\frac{\pi}{3} < x < \frac{3\pi}{2}$ D) $0 < x < 2\pi$
E) $\frac{\pi}{2} < x < \pi$

8.



In the figure, the graph of the derivative function f ' of the function f is given. In which interval is the function f increasing?

A) $-2 < x < 2$
B) $x > 2$
C) $x < -2$
D) $(x < -4) \vee (-1 < x < 3)$
E) $(-4 < x < -1) \vee (x > 3)$

9. Which one of the followings is true for the function $f(x) = 2x^3 + 3x^2 + 12x + 1$?

A) It's value is maximum at $x = 2$
B) It's value is minimum at $x = 1$
C) It has an inflection point at $x = \frac{1}{2}$
D) It is an increasing function
E) It is a decreasing function

10. If the function $f(x) = 2x^3 + ax^2 + bx + c$ has an inflection point at $x = -\frac{1}{2}$, find the value of a

A) 1 B) 2 C) 3 D) 4 E) 6

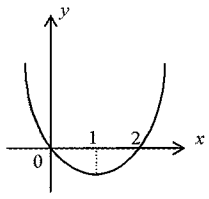
11. In which of the following intervals is the function $f : \Re \to \Re, f(x) = x^2 \cdot (x+3)$ concave down?

A) $(-\infty, -2)$ B) $(-2,0)$
C) $(0, +\infty)$ D) $(-\infty, -1)$
E) $(-1, +\infty)$

12. If point (a, b) is the inflection point of the function $f(x) = x^3 - 3x^2 + 4$, find $a + b$.

A) 1 B) 2 C) 3 D) 4 E) 5

13. The graph of the derivative of the function $f(x)$ is given. Which of the followings is false?



A) The function $f(x)$ has a maximum at $x = 0$.

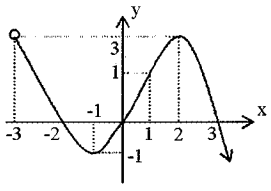
B) The function $f(x)$ has a minimum at $x = 2$.

C) The function $f(x)$ is a third degree function.

D) The function $f(x)$ is increasing in (0,2).

E) The function $f(x)$ has an inflection point at $x = 1$

14. Which of the followings is false for the function given in the figure?



A) The function is a decreasing function in [-3,-1]

B) The function has local extremum points at $(-1, f(-1))$ and $(2, f(2))$

C) The point $(1, f(1))$ is an inflection point

D) $f''(x) < 0$ in $(-1,2)$

E) $f''(x) < 0$ in $(2,3)$

15.

Which one of the followings is false for the function f given in the figure?

A) $f'(0) < 0$

B) $f(d) > 0$

C) $f'(a) = 0$

D) $f''(c) = 0$

E) $f'(b) > 0$