1)

The graph of $y = 5x^4 - x^5$ has a point of inflection at

(A) $(0,0)$ only   (B) $(3,162)$ only   (C) $(4,256)$ only

(D) $(0,0)$ and $(3,162)$ (E) $(0,0)$ and $(4,256)$

2)

For what value of k will $x + \dfrac{k}{x}$ have a relative maximum at $x = -2$?

(A) -4 (B) -2 (C) 2 (D) 4 (E) None of these

3)

The *derivative* of $f(x) = \dfrac{x^4}{3} - \dfrac{x^5}{5}$ attains its maximum value at $x =$

(A) -1 (B) 0 (C) 1 (D) $\dfrac{4}{3}$ (E) $\dfrac{5}{3}$

4)

Let f be the function given by $f(x) = x^3 - 3x^2$. What are all values of c that satisfy the conclusion of the Mean Value Theorem of differential calculus on the closed interval $[0,3]$?

(A) 0 only   (B) 2 only   (C) 3 only   (D) 0 and 3   (E) 2 and 3

5)

Which of the following functions shows that the statement "If a function is continuous at $x = 0$, then it is differentiable at $x = 0$" is false?

(A) $f(x) = x^{-\frac{4}{3}}$ (B) $f(x) = x^{-\frac{1}{3}}$ (C) $f(x) = x^{\frac{1}{3}}$ (D) $f(x) = x^{\frac{4}{3}}$ (E) $f(x) = x^3$

6)

If $f(x) = \dfrac{1}{3}x^3 - 4x^2 + 12x - 5$ and the domain is the set of all x such that $0 \le x \le 9$, then the absolute maximum value of the function f occurs when x is

(A) 0   (B) 2   (C) 4   (D) 6   (E) 9

7)

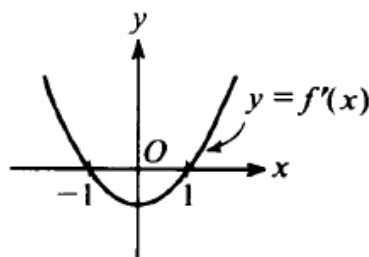If $f(x) = x + \dfrac{1}{x}$, then the set of values for which f increases is

(A) $(-\infty, -1] \cup [1, \infty)$ 　　　　　(B) $[-1, 1]$ 　　　　　(C) $(-\infty, \infty)$

(D) $(0, \infty)$ 　　　　　(E) $(-\infty, 0) \cup (0, \infty)$

8)

An equation of the line tangent to $y = x^3 + 3x^2 + 2$ at its point of inflection is

(A) $y = -6x - 6$ 　　　　　(B) $y = -3x + 1$ 　　　　　(C) $y = 2x + 10$

(D) $y = 3x - 1$ 　　　　　(E) $y = 4x + 1$

9)

The graph of the <u>derivative</u> of f is shown in the figure above. Which of the following could be the graph of f?

(A) 　　　　　(B) 　　　　　(C)

(D) 　　　　　(E)

10)

The position of a particle moving along a straight line at any time t is given by $s(t) = t^2 + 4t + 4$. What is the acceleration of the particle when $t = 4$?

(A) 0   (B) 2   (C) 4   (D) 8   (E) 12

11)

Let f be a function that is continuous on the closed interval $[-2, 3]$ such that $f'(0)$ does not exist, $f'(2) = 0$, and $f''(x) < 0$ for all x except $x = 0$. Which of the following could be the graph of f?

12)

The graph of $y = f(x)$ on the closed interval $[2, 7]$ is shown above. How many points of inflection does this graph have on this interval?

(A) One   (B) Two   (C) Three   (D) Four   (E) Five

13)

The Mean Value Theorem guarantees the existence of a special point on the graph of $y = \sqrt{x}$ between $(0,0)$ and $(4,2)$. What are the coordinates of this point?

(A) $(2,1)$

(B) $(1,1)$

(C) $\left(2,\sqrt{2}\right)$

(D) $\left(\dfrac{1}{2}, \dfrac{1}{\sqrt{2}}\right)$

(E) None of the above

14)

A point moves in a straight line so that its distance at time t from a fixed point of the line is $8t - 3t^2$. What is the *total* distance covered by the point between $t = 1$ and $t = 2$?

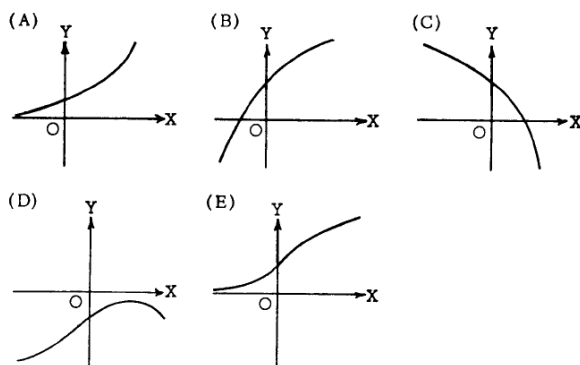(A) 1   (B) $\dfrac{4}{3}$ (C) $\dfrac{5}{3}$ (D) 2   (E) 5

15)

Given the function defined by $f(x) = 3x^5 - 20x^3$, find all values of x for which the graph of f is concave up.

(A) $x > 0$

(B) $-\sqrt{2} < x < 0$ or $x > \sqrt{2}$

(C) $-2 < x < 0$ or $x > 2$

(D) $x > \sqrt{2}$

(E) $-2 < x < 2$

16)

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 $y = f(x)$?

17)

The approximate value of $y=\sqrt{4+\sin x}$ at $x=0.12$, obtained from the tangent to the graph at $x=0$, is

(A) 2.00   (B) 2.03   (C) 2.06   (D) 2.12   (E) 2.24

18)

The point on the curve $2y=x^2$ nearest to $(4,1)$ is

(A) $(0,0)$ (B) $(2,2)$ (C) $(\sqrt{2},1)$ (D) $(2\sqrt{2},4)$ (E) $(4,8)$

19)

For small values of h, the function $\sqrt[4]{16+h}$ is best approximated by which of the following?

(A) $4+\dfrac{h}{32}$ (B) $2+\dfrac{h}{32}$ (C) $\dfrac{h}{32}$

(D) $4-\dfrac{h}{32}$ (E) $2-\dfrac{h}{32}$

20)

If the position of a particle on the x-axis at time t is $-5t^2$, then the average velocity of the particle for $0\le t\le 3$ is

(A) −45   (B) −30   (C) −15   (D) −10   (E) −5

21)

If the graph of $y=x^3+ax^2+bx-4$ has a point of inflection at $(1,-6)$, what is the value of b?

(A) −3   (B) 0   (C) 1   (D) 3

(E)   It cannot be determined from the information given.

22)

The volume of a cylindrical tin can with a top and a bottom is to be 16π cubic inches. If a minimum amount of tin is to be used to construct the can, what must be the height, in inches, of the can?

(A) $2\sqrt[3]{2}$ (B) $2\sqrt{2}$ (C) $2\sqrt[3]{4}$ (D) 4   (E) 8

23)

The absolute maximum value of $f(x)=x^3-3x^2+12$ on the closed interval $[-2,4]$ occurs at $x=$

(A) 4   (B) 2   (C) 1   (D) 0   (E) −2

24)

A particle moves along the x-axis so that at any time $t\geq 0$ its position is given by $x(t)=t^3-3t^2-9t+1$. For what values of t is the particle at rest?

(A) No values   (B) 1 only   (C) 3 only   (D) 5 only   (E) 1 and 3

25)

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) $x>2$

26)

The point on the curve $x^2+2y=0$ that is nearest the point $\left(0,-\dfrac{1}{2}\right)$ occurs where y is

(A) $\dfrac{1}{2}$

(B) 0

(C) $-\dfrac{1}{2}$

(D) −1

(E) none of the above

Answers

1	B
2	D
3	C
4	B
5	C
6	E
7	A
8	B
9	B
10	B
11	E
12	C
13	B
14	C
15	B
16	B
17	B
18	B
19	B
20	C
21	B
22	D
23	A
24	C
25	E
26	B