

**MATHEMATICS**

*Topic: Maxima & Minima*

**Q.1**  $f(c)$  is a maximum value of  $f(x)$  if -

- (A)  $f'(c) = 0, f''(c) > 0$
- (B)  $f'(c) = 0, f''(c) < 0$
- (C)  $f'(c) \neq 0, f''(c) = 0$
- (D)  $f'(c) < 0, f''(c) > 0$

**Q.2**  $f(c)$  is a minimum value of  $f(x)$  if -

- (A)  $f'(c) = 0, f''(c) > 0$
- (B)  $f'(c) = 0, f''(c) < 0$
- (C)  $f'(c) \neq 0, f''(c) = 0$
- (D)  $f'(c) < 0, f''(c) > 0$

**Q.3**  $f(c)$  is a maximum value of  $f(x)$  when at  $x = c$  -

- (A)  $f'(x)$  changes sign from +ve to -ve
- (B)  $f'(x)$  changes sign from -ve to +ve
- (C)  $f'(x)$  does not change sign
- (D)  $f'(x)$  is zero

**Q.4**  $f(c)$  is a minimum value of  $f(x)$  when at  $x = c$ -

- (A)  $f'(x)$  changes sign +ve to -ve
- (B)  $f'(x)$  changes sign from -ve to +ve
- (C)  $f'(x)$  does not change sign
- (D)  $f'(x)$  is zero

**Q.5** The correct statement is -

- (A)  $f(c)$  is an extreme value of  $f(x)$  if  $f'(c) = 0$
- (B) If  $f(c)$  is an extreme value of  $f(x)$  then  $f'(c) = 0$
- (C) If  $f'(c) = 0$  then  $f(c)$  is an extreme value of  $f(x)$
- (D) All the above statements are incorrect

**Q.6** If for a function  $f(x)$ ,  $f'(a) = 0 = f''(a) = \dots = f^{(n-1)}(a)$  but  $f^{(n)}(a) \neq 0$  then at  $x = a$ ,  $f(x)$  is minimum if -

- (A)  $n$  is even and  $f^{(n)}(a) > 0$
- (B)  $n$  is odd and  $f^{(n)}(a) > 0$
- (C)  $n$  is even and  $f^{(n)}(a) < 0$
- (D)  $n$  is odd and  $f^{(n)}(a) < 0$

**Q.7** The point of maxima of  $\sec x$  is -

- (A)  $x = 0$                       (B)  $x = \pi/2$
- (C)  $x = \pi$                       (D)  $x = 3\pi/2$

**Q.8**  $x^3 - 3x + 4$  is minimum at -

- (A)  $x = 1$                       (B)  $x = -1$
- (C)  $x = 0$                       (D) No where

**Q.9** The maximum value of  $2x^3 - 9x^2 + 100$  is -

- (A) 0                      (B) 100  
(C) 3                      (D) 30

**Q.10** If  $f(x) = x^3 - kx + 7$  is maximum at  $x = -1$ , then the value of  $k$  is -

- (A) 3                      (B) 6                      (C) -3                      (D) -6

**Q.11** Which of the following function has no extreme point-

- (A)  $2^x$                       (B)  $[x]$   
(C)  $\log_{10}x$                       (D) All these functions

**Q.12** If for a function  $f(x)$ ,  $f'(a) = 0 = f''(a) = \dots = f^{(n-1)}(a)$  but  $f^{(n)}(a) \neq 0$  then at  $x = a$ ,  $f(x)$  is maximum if -

- (A)  $n$  is even and  $f^{(n)}(a) > 0$   
(B)  $n$  is odd and  $f^{(n)}(a) > 0$   
(C)  $n$  is even and  $f^{(n)}(a) < 0$   
(D)  $n$  is odd and  $f^{(n)}(a) < 0$

**Q.13** The maximum value of

$5 \cos \theta + 3 \cos \left( \theta + \frac{\pi}{3} \right) + 3$  is -

- (A) 5                      (B) 10                      (C) 11                      (D) -1

**Q.14** The function  $f(x) = \sum_{K=1}^5 (x-K)^2$  assumes minimum value for  $x$  given by

- (A) 5                      (B) 3                      (C)  $5/2$                       (D) 2

- Q.15** If  $f(x) = x^3 - 3x^2 + 3x + 7$ , then -
- (A)  $f(x)$  has a maximum at  $x = 1$
  - (B)  $f(x)$  has a minimum at  $x = 1$
  - (C)  $f(x)$  has a point of inflexion at  $x = 1$
  - (D) None of these
- Q.16** In  $[0, 2]$  the point of maxima of  $3x^4 - 2x^3 - 6x^2 + 6x + 1$  is -
- (A)  $x = 0$                       (B)  $x = 1$
  - (C)  $x = 1/2$                     (D) Does not exist
- Q.17** If  $f'(c)$  changes sign from negative to positive as  $x$  passes through  $c$ , then -
- (A)  $f(c)$  is neither a maximum nor a minimum value of  $f(x)$
  - (B)  $f(c)$  is a maximum value of  $f(x)$
  - (C)  $f(c)$  is a minimum value of  $f(x)$
  - (D)  $f(c)$  is either a maximum or a minimum value of  $f(x)$
- Q.18** If  $f'(c)$  changes sign from positive to negative as  $x$  passes through  $c$ , then,
- (A)  $f(c)$  is neither a maximum nor a minimum value of  $f(x)$
  - (B)  $f(c)$  is a maximum value of  $f(x)$
  - (C)  $f(c)$  is a minimum value of  $f(x)$
  - (D)  $f(c)$  is either a maximum or minimum value of  $f(x)$
- Q.19** If  $f'(c) < 0$  and  $f''(c) > 0$ , then at  $x = c$ ,  $f(x)$  is -
- (A) maximum
  - (B) minimum
  - (C) neither maximum nor minimum
  - (D) either maximum or minimum

**Q.20** If for a function  $f(x)$ ,  $f'(b)=0, f''(b) = 0, f'''(b) > 0$ , then  $x = b$  is -

- (A) a maximum point                      (B) a minimum point  
(C) an extreme point                      (D) not an extreme point

**Q.21** The maximum height of the curve

$y = 6 \cos x - 8 \sin x$  above  $x$  axis is-

- (A) 5    (B) 10  
(C) 15    (D) None of these

**Q.22** The minimum value of  $a \sec x + b \operatorname{cosec} x, 0 < a < b, 0 < x < \pi/2$  is =

- (A)  $a + b$                                       (B)  $a^{2/3} + b^{2/3}$   
(C)  $(a^{2/3} + b^{2/3})^{3/2}$                       (D) None of these

**Q.23** The minimum value of  $\frac{x}{\log x}$  ( $x > 0$ ) is -

- (A)  $e$     (B)  $1/e$   
(C) 0    (D) Does not exist

**Q.24** For what value of  $x, x^2 \log (1/x)$  is maximum-

- (A)  $e^{-1/2}$                                       (B)  $e^{1/2}$                                       (C)  $e$     (D)  $e^{-1}$

**Q.25** For what value of  $k$ , the function:

$f(x)=kx^2+\frac{2k^2-81}{2}x-12$ , is maximum at

$x = 9/4$

- (A)  $9/2$     (B)  $-9$   
(C)  $-9/2$     (D) 9

**Q.26** The greatest value of the function

$$f(x) = \cos [xe^{x^2} + 2x^2 - x], -1 < x < \infty \text{ is-}$$

- (A) -1                      (B) 1  
(C) 0                        (D) None of these

**Q.27** For  $f(x) = \sqrt{3} \sin x + 3 \cos x$ , the point

$$x = \pi/6 \text{ is -}$$

- (A) a local maximum  
(B) a local minimum  
(C) None of these  
(D) a point of inflexion

**Q.28** Which of the following functions has maximum or minimum value -

- (A)  $\sinh x$                 (B)  $\cosh x$   
(C)  $\tanh x$                 (D) None of these

**Q.29** The maximum value of

$$5 \sin \theta + 3 \sin (\theta + \pi/3) + 3 \text{ is -}$$

- (A) 11                      (B) 12                      (C) 10                      (D) 9

**Q.30** The maximum value of  $(x - 2)(x - 3)^2$  is-

- (A) 2/27                    (B) 1/27  
(C) 4/27                    (D) 5/27

## ANSWER KEY

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<b>Que.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Ans.</b>	B	A	A	B	B	A	C	A	B	A
<b>Que.</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
<b>Ans.</b>	D	C	B	B	C	C	C	B	C	D
<b>Que.</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
<b>Ans.</b>	B	C	A	A	B	B	A	B	C	C

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