MATHS

BOOKS - NTA MOCK TESTS

APPLICATION OF DERIVATIVES TEST

Single Choice

1. A window is in the form of a rectangle with length L and breadth B sumounted by a semi cricle. If the totla perimeter of the window is

30m, then the dimensions of the window so that maximum light is admitted would be

A. $L = \frac{30}{\pi + 4}m$

$B = \frac{30}{\pi + 4}m$

B. $L = \frac{15}{\pi + 4}m$

$b = \frac{30}{\pi + 4}m$

C. $L = \frac{30}{\pi + 4}m$

$B = \frac{60}{\pi + 4}m$

D. $L = \frac{60}{\pi + 4}m$

$B = \frac{30}{\pi + 4}m$

Answer: D

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2. An open box with a square base is to be made out of a given quantity of cardboard of area c^2 square units. What would be the maximum volume of the box?

A. $\frac{c^3}{10\sqrt{5}}$ cubic units

B. $\frac{c^3}{6\sqrt{3}}$ cubic units

C. $\frac{c^3}{5\sqrt{8}}$ cubic units

D. b

Answer: B

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3. The equation of a tangent to the curve $y = \sqrt{3x - 2}$ which parallel to the line $4x - 2y + 5 = 0$ would be:

A. $y = 2x - \frac{24}{23}$

B. $x = 2y - \frac{23}{24}$

C. $y = 2x - \frac{23}{24}$

D. $y = 2x + \frac{23}{24}$

Answer: C

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4. The number of tangents to the curves $y = \cos(x + y), |x| \leq 2$, that are parallel t the line $x + 2y = 0$ is

A. 2

B. 1

C. 0

D. 3

Answer: A

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5. The positive real number x when added to its reciprocal gives the minimum value of the sum at x equal to:

A. 1

B. -1

C. -2

D. 2

Answer: A

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6. If $f'(x) = |x| = \{x\}$ where {x} denotes the fractional part function of x then f(x) is decreasing in

A. $\left(\frac{-1}{2}, 0\right)$

B. $\left(\frac{-1}{2}, 2\right)$

C. $\left(\frac{-1}{2}, -2\right)$

D. $\left(\frac{1}{2}, \infty\right)$

Answer: A

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7. A ladder 10 m long rests against a vertical wall with the lower end on the horizontal ground. The lower end of the ladder is pulled

aln the ground away from the wall at the rate fo $3cm/s$. The height of the upper and while it is descending at the rate of $4cm/s$ is

A. $4\sqrt{3}m$

B. $5\sqrt{3}m$

C. $8m$

D. $6m$

Answer: D

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8. A particle moves along a straight line with the law of motion given by $s^2 = at^2 + 2bt + c$, then the accelerationn varies as (wher as : displacement and t, time)

A. $\frac{1}{s^3}$

B. $\frac{1}{s}$

C. $\frac{1}{s^4}$

D. $\frac{1}{s^2}$

Answer: A

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9. A sphereical iron ball of radius 10 cm, coated with a layer of ice of uniform thickness, melts at a rate of $100\pi cm^3/\min$. The rate at which the thickness of ice deceases when the thickness of ice is 5 cm, is

A. $\frac{1}{54}\pi$cm /min

B. $\frac{1}{9}\pi$ cm/min

C. $\frac{1}{36}$cm/min

D. $\frac{1}{9}$ cm/min

Answer: D

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10. A equation of the tangent to the curve $x = 2\cos^3\theta$ and $y = 3\sin^3\theta$ at the point $\theta = \frac{\pi}{4}$ is

A. $2x + 3y = 3\sqrt{2}$

B. $2x - 3y = 3\sqrt{2}$

C. $3x + 2y = 3\sqrt{2}$

D. $3x - 2y = 3\sqrt{2}$

Answer: C

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11. The two cuves $x^3 - 3xy^2 + 2 = 0$and $3x^2y - y^3 - 2 = 0$

A. cut at right angle

B. touch each other

C. cut an an angle $\frac{\pi}{3}$

D. cut at an angle $\frac{\pi}{4}$

Answer: A

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12. The minimum value of $f(x) = e^{(x^4 - x^3 + x^2)}$ is

A. e

B. $-e$

C. 1

D. -1

Answer: C

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13. The denominator of a fraction exceeds the square of the numerator by 16, then the least value the fraction is

A. $-\frac{1}{4}$

B. $-\frac{1}{8}$

C. $\frac{1}{12}$

D. $\frac{1}{16}$

Answer: B

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14. A point on the curve $x^3 - 8a^2y = 0$, where the slope of the normal is $-\frac{2}{3}$ is

A. (a, a)

B. $(2a, 2a)$

C. $(2a, a)$

D. None of these

Answer: C

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15. The function $f(x) = \frac{x}{1 + |x|}$ is

A. strictly increasing

B. strictly decreasing

C. neithe increasing nor decreasing

D. not differentiable at x=0

Answer: A

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16. The function $f(x) = 2x^3 - 3x^2 - 12x + 4$ has

A. no maxima and minima

B. One maximum and one minimum

C. Two maxima

D. Two minima

Answer: B

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17. The equation of the tangent to the curve $(1+x^2)y = 2-x$, where it crosses the x-axis is

A. $x + 5y = 2$

B. $x - 5y = 2$

C. $5x - y = 2$

D. $5x + y - 2 = 0$

Answer: A

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18. The acute angle of intersection between the curves $y = \sin x$ and y=cos x` is

A. $\tan^1\left(2\sqrt{2}\right)$

B. $\tan^{-1}\left(3\sqrt{3}\right)$

C. $\tan^{-1}\left(3\sqrt{3}\right)$

D. $\tan^{-1}\left(5\sqrt{2}\right)$

Answer: A

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19. The acute angle between the curve $y = x^2$ and $x = y^2$ at there common point other than origin is

A. $\tan^{-1}\left(\frac{4}{3}\right)$

B. $\tan^{-1}(1)$

C. 90°

D. $\tan^{-1}\left(\frac{3}{4}\right)$

Answer: D

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20. IF $y = 4x - 5$ is tangent to the curve $y^2 = px^3 + q$ at (2,3) then (p,q) is

A. $(2, 7)$

B. $(-2, 7)$

C. $(-2, -7)$

D. $(2, -7)$

Answer: D

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21. If $f(x) = \frac{x^2 - 1}{x^2 + 1}$ for evey real number x then the minimum value of f

A. does not exist because f is unbounded.

B. is not attained even thorugh f is bounded

C. is equal ot 1

D. is equal to -1

Answer: D

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22. If $f(x) = x.\, e^{x(1-x)}$ then f(x) I

A. increasing on $\left(-\frac{1}{2}, 1\right)$

B. decreasing on R

C. increasing on R

D. deceasing on $\left(-\frac{1}{2}, 1\right)$

Answer: A

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23. If M be the greatest value and m be the least value of $f(x) = 2x^3 - 3x^2 - 12x + 1$, for $-1 \leq x \leq 3/2$, then the ordered pair (M,m) is

A. (8,-19)

B. (8,-17)

C. (-17,-19)

D. None of these

Answer: B

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24. If $f(x) = \tan^{-1}(g(x))$ {where g(x) is monotonically increasig for $0 < x < \frac{\pi}{2}$}then f(x) is

A. increasing on $\left(0, \frac{\pi}{2}\right)$

B. deceasig on $\left(0, \frac{\pi}{2}\right)$

C. increasing on $\left(0, \frac{\pi}{4}\right)$

D. decreasing on $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

Answer: A

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25. Let $f(x) = \begin{cases} |x| & 0 < |x| \leq 2 \\ 1 & x = 0 \end{cases}$ then at x=0 f has

A. a local maximum

B. no local maximum

C. a local minimum

D. no extremum

Answer: A

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26. If $f(X) = \frac{x}{\sin x}$ and $g(x) = \frac{x}{\tan x}$ where $0 < x \leq 1$, then in this interval

A. f(x) and g(x) are increasing functions

B. both f(x) and g(x) are decreasign functions

C. f(x) is an increasing function

D. g(x) is an increasing function

Answer: C

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27. The function $y = f(x)$ is represented paamatrically by $x = t^5 - 5t^3 - 20t + 7$ and $y = 5t^3 - 3t^2 - 18t + 3, (-2 < t < 2).$

The minimum of y=f(x) occurs at

A. $t = -1$

B. $t = 0$

C. $t = \frac{1}{2}$

D. $t = \frac{3}{2}$

Answer: D

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28. The set of values of b for which local extremum values of the function f(x) are positive where

$f(x) = \frac{2}{3}a^2x^3 - \frac{5a}{2}x^2 + 3x + b$ and maxima occurs at $x = \frac{1}{3}$ is

A. $(-4, \infty)$

B. $\left(-\frac{3}{8}, \infty\right)$

C. $\left(-10, \frac{3}{8}\right)$

D. None of these

Answer: B

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29. If $a < 0$ then the function $\left(e^{ax} + e^{-ax}\right)$ is a decreasing function for all

A. $x < 0$

B. $x > 0$

C. $x < 1$

D. $x > 1$

Answer: A

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30. The triangle formed by the tangent to the curve $f(x) = x^2 + bx - b$ at the point (1, 1) and the coordinate axes lies in the first quadrant. If its area is 2 sq. Units, then the value of b is

A. -1

B. 3

C. -3

D. 1

Answer: C

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