DODOLA SPECIAL BOARDING SCHOOL GRADE 12TH MATHEMATICS WORKSHEET TWO FROM UNIT TWO IN 2017E.C

1. If $(x) = \sqrt{1+\sqrt{x}}$, then $f'(1) =$ ____ A. $\frac{1}{4}$ B. $\frac{\sqrt{2}}{8}$ C. $\sqrt{2}$ D. $\frac{\sqrt{2}}{4}$

2. What is the critical numbers of f(x) = $x^2 - 4$? A.{0} B.{ -2, 2} C.{0,4} D.{-2,0,2}

3. f(x) = x^2- 4 is decreasing on:- A. $(-\infty, 0]$ B. $[0, \infty)$ C. $[2, \infty)$ D. [-2,2]

4. If $f(x) = x^6 + 6, then\ f'(-1) =$ _____ A. 12 B. 6 C. 0 D. 1

5. What is the largest interval where f(x) = $2x^3$-$3x^2$-12x +2 is increasing?

A . $(-\infty, -1]$ and $[2, \infty)$ B. $[2, \infty)$ C.[-1,1] D. (-1,2]

6. The function in the above question number 5 has local maximum at one of the following values A. 2 B. -1 C. 1 D. 0

8.The sum of the number and twice the other is 200. What are the numbers if their product is as large as possible ?

A.100 , 50 B. 120 , 40 C. 60 ,55 D. 80 , 60

9. A radius of spherical balloon is being inflated at the rate of 0.2cm/sec. How fast is the volume(in cm^3/sec) increasing when the radius is 5cm ? A. $64\pi/5$ B. 20π C. 2π D. $25\pi/4$

10. Which one of the following is the area of the region bounded by the graph of $f(x) = x^2 + 1$ and x-axis over the interval [-1,2] in unit square?

A. 12 B. 4 C. 8 D. 6

11.$\int_0^2 (3x+2)dx =$ _____ A. 10 B. 16 C. 32 D. 9

12. Which one of the following is equation of normal line to the graph of $f(x) = x^3 - 2x$ at the point $(1, -1)$?

A. $x - y + 2 = 0$ B. $x + y = 0$ C. $x - y - 2 = 0$ D. $x - y = 0$

13. If $f(x) = \sqrt{2x+4}$,then $f'(6) =$ _____ A. $\frac{1}{2}$ B. . $\frac{1}{9}$ C. . 4 D. . $\frac{1}{4}$

14. Let f(x) = $\frac{6x}{x+a}$, for what value of a does $f'(a) = 3$? A. 1/3 B. 2/3 C. 3/2 D. ½

15. $\int_0^2 (10)dx =$ _____ A. 10 B. 0 C. 20 D. 9

16. A tin can of volume $54\pi cm^3$ is to be made in the form of a right circular cylinder that has both flat top and flat bottom. What is the base radius of the tin if it is to be made of the least amount of metal?

A. $2cm$ B. $3cm$ C. $4cm$ D. $6cm$

17. Air is being pumped into a spherical balloon so that its volume increases at a rate of $50cm^3/s$. How fast is the radius of the balloon increasing when the diameter is $5cm$?

A. $\frac{1}{50\pi} cm/s$ B. $\frac{1}{25\pi} cm/s$ C. $\frac{5}{\pi} cm/s$ D. $\frac{2}{\pi} cm/s$

18. If $h(x) = \sqrt{1+\sqrt{x}}$, then which of the following is equal to $h'(x)$?

A. $\frac{1}{2\sqrt{1+\sqrt{x}}}$ B. $\frac{1}{\sqrt{x+x\sqrt{x}}}$ C. $\frac{x}{\sqrt{x+\sqrt{x}}}$ D. $\frac{1}{4\sqrt{x+x\sqrt{x}}}$

19. Which one of the following is the set of critical numbers of $f(x) = \frac{8}{3}x^{8/3} - 6x^{2/3}$?

A. {-2, 2} B. {-2, 0,2} C. {-1, 0, 1} D. {-1,1}

20. What is the value of k so that $(x) = \frac{x}{x^2+k}$ has a relative extremum at x =2?

A. 8 B. 4 C. 2 D. 0

21.Which one of the following is the set of all critical numbers of $f(x) = x^3 - 2x^2 + x + 1$ on the interval [-1,3]?

A. $\{\frac{1}{3}, -1\}$ B. $\{\frac{1}{3}, 1\}$ C. {1} D. $\{\frac{1}{3}, -2\}$

22. If $f(x) = x^{\frac{3}{2}} + \frac{8}{x} + 7$, then as x gets closer and closer to 4, the value of $\frac{f(x)-f(4)}{x-4}$ = _____.

A. $\frac{3}{2}$ B. . $\frac{5}{2}$ C. 1 D. $\frac{7}{2}$

23. A water tank is in the form of aright circular cylinder with base radius 2 m and height 3 m. If water is pumped in to the tank at a rate of 0.5 m^3/min, what is the rate at which the water level is rising?

A. $\frac{1}{8\pi} m/min$ B. $\frac{4\pi}{3} m/min$ C. $\frac{3\pi}{8} m/min$ D. $\frac{8}{\pi} m/min$

24. A position of a particle is given by the equation $S(t) = 4t^2 - 4t + 1$ where t is measured in seconds and S in meters. Which of the following is **NOT** true about the motion of the particle?

A. The particle is at rest at t = 0.5 seconds.

B. The acceleration of the particle at 1 sec is 48 m/sec^2.

C. The velocity v at any time t is given by $v(t) = 1613t^3 - 4$.

D. The velocity at 2 seconds is given by 124 m/sec.

25. If $f'(1) = 4$, $f(1) = 3$ and $g'(3) = 5$, then $(gof)'(1)$ is equal to:

A. 15 B. 20 C. 3 D. 5

26. The acceleration of a body at any time t is given by a(t) = 4 - 2t + 3t^2 with initial velocity

V(0) = 5. Then what is the velocity V of the body as a function of time?

A. V(t) = 9 - $t^2 + t^3$ B. $V(t)$ = -2 + 6t

C. V(t) = 5 + 4t - $t^2 + t^3$ D. V(t) = 1 + 4t - $t^2 + t^3$

27. What is the derivative of the function $f(x) = 3x^2 + 2\sqrt{x} - 4x \; at \; x = 1$?

A. 1 B. 3 C. -3 D. -1

28. Let $f \; and \; g$ be two functions. Which one of the following statement is true about $f \; and \; g$?

A. $If \; f'(a) = 0$, then the normal line to the graph of $f \; at \; (a, f(a)) \; is$ x = a.

B. The line y = 0 is a tangent line to the graph of $f(x) = \sqrt{x+1} \; at \; (-1,0)$.

C. If $f \; and \; g$ are differentiable at a, then $\frac{f}{g}$ is differentiable at a

D. $If \; f'(a) = 0$, then the tangent line to the graph of $f \; at \; (a, f(a)) \; is \; y = a$.

29. If the perimeter of a rectangle is 120 m, what are the $length \; l \; and \; width \; w$ of the rectangle that maximizes its area?

A. l=30 m and w = 30m B. l=50 m and w = 10 m

C. l=40 m and w = 20 m D. l=35 m and w = 25 m

30. The volume of a cube is increasing at a rate of 9$cm3/sec$. How fast is the surface area increasing when the length of the edge is 10 cm?

A. 3.6 cm2⁄sec C. 90 cm2⁄sec

B. 36 cm2⁄sec D. 6 cm2⁄sec

31. $\int_0^2 \frac{x^2-1}{x-1} dx =$ _____ A. 1 B. ½ C. 2 D. 4

32.Which one of the following is equal to $\int_{-1}^{2} x^2|x|dx$? A. 4 B. 17/4 C. 1/4 D. 15/4

33.If $f'(x) = 2x + 1$ *and* $f(0) = 0$, *then what is* $f(x)$? A. $2x^2+x-2$ B. x^2+x+2 C. x^2+x-2 D. $2x^2+x+2$

34.What is the area (in sq. unit) of the region bound by $f(x) = x^3 - 4x$ and x-axis on[-2,2]?

A -2 B. 0 C. 4 D. 8

35.Let $f(x) = \frac{\sqrt{x-3}}{x^2}$, which one is true about f(x)?

A. f has local maximum value 1/16 B. f has local minimum at 4

C. f has local minimum value 1 D. f has local maximum at 1

36. Let $f(x) = \frac{6x}{x+a}$, for what value of a does $f'(a) = 3$? A. 1/3 B. 2/3 C. 3/2 D. ½

37.Which one of the following is the set of all critical numbers of $f(x) = \frac{1}{3}x^3 + |9x - 1|$?

A. {-3,1/9,3} B. {1/3} C. {-3,3} D. {1/9,-3}

38. A ladder 6m long rests against a vertical wall. If the bottom of the ladder slides away from the wall at the rate (speed) of $\frac{1}{2}m/sec$, how fast is the angle between the top of the ladder and the wall changing when the angle is $\frac{\pi}{4}rad$? A. $\frac{\sqrt{2}}{12}m/sec$ B. $\frac{\sqrt{2}}{2}m/sec$ C. $\frac{\sqrt{2}}{6}m/sec$ D. $\frac{\sqrt{2}}{3}m/sec$

39. A box is given with square base, an open top and volume of 32 cubic unit.If x is the length of each side of its base and y is its height , how many unit should x and y be in order to make the box with the smallest amount of material ?

A. x=4, y=2 B. x=2 , y=8 C. $x=\sqrt{8}$ y=4 D. $x=\sqrt{2}$ y=16

4. What is the minimum value of $f(x) = \frac{1}{x}$ on [-1 , 2] ?

A. no minimum value B. -1 C. 0 D -1/2

41.At what values of x does $f(x) = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 2x + 1$ have the local maximum ?

$A. x = 2 \quad B. x = -1 \quad C. x = 5 \quad D. x = 2, x = -1$

42.The volume V of a melting ice cube after t seconds is $V = 2000 - 40t + 0.2t^2 (in\ cm^3)$.How fast is the volume changing when t = 40 seconds?

A. 24 cm^3/sec B. 15cm^3/sec C. -15cm^3/sec D. -24cm^3/sec

43. If $f(0) = -1$, $f(1) = 2$ and $f'(x)$ is continuous on[0, 1], then which of the following is equal to $\int_0^1 \left(f'(x)\sqrt{2 + f(x)}\right) dx$?

A. 16/3 B. 14/3 C. 8/3 D. 4/3

44. If the line $= -8x + k \; is \; tangent \; to \; the \; curve \; y = 3x^2 + 4x + 1$, then the value of k is:-

A. 17 B. -11 C. 7 D. -13

45. Find the value of a, b, c , and d so that $h(x) = ax^3 + bx^2 + cx + d$ will be extreme values at $(2,1) \; and \; (2,3)$. Is this value maximum or minimum ?

46.A farmer has 240m of fencing material and wants to fence a rectangular field that borders a straight river .(No fence is needed along the river). What are the dimensions of the field that has the largest area?

47.Find absolute extreme values of the function $f(x) = \begin{cases} x^3 - \frac{x}{3}; 0 \le x \le 1 \\ x^2 + x - \frac{4}{3}; 1 < x \le 2 \end{cases}$ on the interval [0,2].

48.Determine an equation of the tangent line to the curve $f(x) = x^2 + 2x$ at P(1,3).

49 Find an equation of the tangent line to the curve $f(x) = \frac{2x+1}{x+2}$ at the point (1,1).

50. Find critical points of $f(x) = x^3 - 12x - 5$ and identify the interval on which f is increasing or decreasing

51. Find critical point of $f(x) = x^{1/3}(x - 4)$ and identify the interval on which f is increasing or decreasing

52. Find the rate of change of the area of a circle per second with respect to its radius r when $r = 5 \; cm.$

57. The volume of a cube is increasing at a rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of an edge is 10 centimeters ?

58. A stone is dropped into a quiet lake and waves move in circles at a speed of 4cm per second. At the instant, when the radius of the circular wave is 10 cm, how fast is the enclosed area increasing?

59. The length x of a rectangle is decreasing at the rate of 3 $cm/minute$ and the $width\ y$ is increasing at the rate of $2cm/minute$. When $x = 10cm\ and\ y = 6cm$, find the rates of change of

(a) the perimeter and (b) the area of the rectangle

60.The total cost $C(x)$ in Rupees, associated with the production of x units of an item is given by $C(x) = 0.005\,x^3 - 0.02\,x^2 + 30x + 5000$ .Find the marginal cost when 3 units are produced, where by marginal cost we mean the instantaneous rate of change of total cost at any level of output.

61. The total revenue in Rupees received from the sale of $x\ units$ of a product is given by $R(x) = 3x^2 + 36x + 5$. Find the marginal revenue, when $x = 5$, where by marginal revenue we mean the rate of change of total revenue with respect to the number of items sold at an instant.

62. Find all points of local maxima and local minima of the function f given by

$$f(x) = x^3 - 3x + 3.$$

63. Find local maximum and local minimum values of the function f given by

$$f(x) = 3x^4 + 4x^3 - 12x^2 + 12$$

64. Find the absolute maximum and minimum values of a function f given by $f(x) = 2x^3 - 15x^2 + 36x + 1$ on the interval $[1, 5]$

65. Find absolute maximum and minimum values of a function f given by

$$f(x) = 12x^{3/4} - 6x^{1/3}\ on\ [-1,1]$$

66. Find intervals in which the function given by $f(x) = \frac{3}{10}x^4 - \frac{4}{5}x^3 - \frac{36}{5}x + 11$ is

a/increasing b/decreasing

67. A circular disc of radius 3 cm is being heated. Due to expansion, its radius increases at the rate of $0.05\ cm/s$. Find the rate at which its area is increasing when radius is $3.2\ cm$.

68. An open topped box is to be constructed by removing equal squares from each corner of a 3 meter by 8 meter rectangular sheet of aluminum and folding up the sides. Find the volume of the largest such box.

69. Find the equation of each tangent of the function $f(x) = x^3 - 5x^2 + 5x - 4$ which is parallel to the line $y = 2x + 1$.

70. Find the equation of each tangent of the function $f(x) = x^3 + x^2 + x + 1$ which is perpendicular to the line $2y + x + 5 = 0$.

71.Find the equation of the normal to the curve $y = x^2 at\ x = 2$

72. Find the equation of the tangents to $y = x^2 + x$ that pass through $(1, 1)$.

73. The slope of the tangent to a curve at $P(2, 5)\ is\ 3$. Write down the equation of the tangent and the normal at P

74. Find the equation of tangent line to $y = x^2 - 5\,x + 7$ that pass through $(2, 1)$.