1. A point that lies on the tangent line to the curve $y = \dfrac{1}{1-x}$ at the point $\left(3, -\dfrac{1}{2}\right)$ is

    (a) $(5,0)$ ————————————————————————(correct)

    (b) $(1,1)$

    (c) $(2,0)$

    (d) $(-3,2)$

    (e) $(-1,1)$

2. $\displaystyle\lim_{\triangle x \to 0} \frac{(-2+\triangle x)^3 + 8}{\triangle x} =$

    (a) 12 ————————————————————————(correct)

    (b) -12

    (c) -2

    (d) 8

    (e) -8

3. If $y = x^{\ln x}$, then $y'(e) =$

(a) 2 ————————————————————————————(correct)

(b) e

(c) 1

(d) 0

(e) $\dfrac{1}{e}$

4. The limit $\lim\limits_{x \to \infty} \left(\sqrt{4x^2 + x} - 2x \right) =$

(a) $\dfrac{1}{4}$ ————————————————————————(correct)

(b) ∞

(c) $-\infty$

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

(e) 2

5. The equation of the tangent line to the curve $9x^2 + 4y^2 = 13$ at the point $(1,1)$ is given by:

(a) $9x + 4y = 13$ _____(correct)

(b) $9x + 4y = 8$

(c) $9x - 4y = 9$

(d) $9x - 4y = 7$

(e) $9x + 4y = 11$

6. If $y = -2x + 3$ is the tangent line to the curve of $f(x) = kx^2$, then $k =$

(a) $-\dfrac{1}{3}$ _____(correct)

(b) -3

(c) -2

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

(e) 0

7. The sum of all values of c that satisfy the Mean Value Theorem for $f(x) = \dfrac{x}{x-5}$ on $[1, 4]$ is

(a) 3 —————————————————————————————(correct)

(b) 7

(c) 10

(d) 5

(e) 9

8. A man 2 meters tall walks at a rate of 1.5 meters per second a way from a light that is 5 meters above the ground. The rate at which the length of his shadow is changing when he is 3 meters from the base of the light is equal to

(a) 1 m/sec ————————————————————————(correct)

(b) 2 m/sec

(c) 1.5 m/sec

(d) 0.5 m/sec

(e) 2.5 m/sec

9. The number x at which the function $f(x) = 2x + \dfrac{1}{x}$ has a relative minimum is

    (a) $\dfrac{1}{\sqrt{2}}$ ————————————————————————(correct)

    (b) $-\dfrac{1}{\sqrt{2}}$

    (c) 0

    (d) $\sqrt{2}$

    (e) $-\sqrt{2}$

10. Which of the following statements is true about the function

$$f(x) = x - \arcsin x$$

    (a) f is decreasing on $(-1, 1)$ ————————————————(correct)

    (b) f has a relative minimum at 0

    (c) f has a relative maximum at 0

    (d) f is increasing on $(-1, 1)$

    (e) f is increasing on $(-1, 0)$ and decreasing on $(0, 1)$

11. Which of the following statements is true about the graph of $f(x) = e^{-(x-3)^2}$?

   (a) It is concave up on $\left(3 + \dfrac{1}{\sqrt{2}}, \infty\right)$.   (correct)

   (b) It is concave up on $(3, \infty)$.

   (c) It is concave up on $\left(3 - \dfrac{1}{\sqrt{2}}, 3 + \dfrac{1}{\sqrt{2}}\right)$.

   (d) It is concave down on $(-\infty, \infty)$.

   (e) It is concave down on $\left(-\infty, 3 - \dfrac{1}{\sqrt{2}}\right)$.

12. The number of inflection points the function $f(x) = \sin x$ has in the interval $\left[-\dfrac{5\pi}{2}, \dfrac{5\pi}{2}\right]$ is

   (a) 5   (correct)

   (b) 4

   (c) 3

   (d) 2

   (e) 1

13. $\lim\limits_{x \to \infty} \left(1 - \dfrac{1}{x}\right)^{x} =$

    (a) $\dfrac{1}{e}$ ————————————————————————————(correct)

    (b) e

    (c) 1

    (d) 0

    (e) ∞

14. $\lim\limits_{x \to 0} \dfrac{4x - 2\sin 2x}{2x^3} =$

    (a) $\dfrac{4}{3}$ ————————————————————————————(correct)

    (b) 0

    (c) ∞

    (d) $\dfrac{2}{3}$

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

15. Let b and c be positive numbers, and $f(x) = \dfrac{x^2 + bx + c}{x + b}$. Then

   (a) $y = x$ is a slant asymptote. _____(correct)

   (b) $y = -b$ is a vertical asymptote.

   (c) $y = \dfrac{c}{b}$ is an x-intercept.

   (d) f has one horizontal asymptote.

   (e) f has two horizontal asymptotes.

16. The curve $f(x) = \dfrac{x - 1}{e^x}$ intersects its horizontal asymptote at $x =$

   (a) 1 _____(correct)

   (b) 0

   (c) e^{-1}

   (d) e^{-2}

   (e) e

17. If we have two positive numbers such that the sum of the first number squared and the second number is 108 and the product of the two numbers is a maximum, then their sum is equal to

   (a) 78 ——————————————————————————(correct)
   (b) 66
   (c) 52
   (d) 36
   (e) 88

18. If a manufacturer wants to design an open box having a square base and a surface area of $192\,m^2$, then the side length of the square base that will produce a box with maximum volume is

   (a) 8 ——————————————————————————(correct)
   (b) 6
   (c) 9
   (d) 4
   (e) 10

19. A point on the graph of $y = 4 - x^2$ that is closest to the point $(0,0)$ is

(a) $\left(\sqrt{\dfrac{7}{2}}, \dfrac{1}{2} \right)$ ————————————————————————————(correct)

(b) $(0, 4)$

(c) $\left(\sqrt{\dfrac{3}{2}}, \dfrac{5}{2} \right)$

(d) $(1, 3)$

(e) $\left(\sqrt{\dfrac{1}{2}}, \dfrac{7}{2} \right)$

20. Let $\triangle x = 0.1$, the differential of $f(x) = \dfrac{1}{x}$ at $x = -1$ is

(a) $-\dfrac{1}{10}$ ————————————————————————————(correct)

(b) $-\dfrac{1}{9}$

(c) $\dfrac{1}{10}$

(d) $\dfrac{1}{9}$

(e) $-\dfrac{1}{11}$

21. The tangent line approximation of the function $f(x) = \dfrac{1}{1 + e^{-x}}$ at $x = 0$ is

(a) $y = \dfrac{1}{4}x + \dfrac{1}{2}$ ————————————————————————————(correct)

(b) $y = \dfrac{1}{2}x + \dfrac{1}{4}$

(c) $y = \dfrac{1}{2}x - \dfrac{1}{4}$

(d) $y = \dfrac{1}{4}x - \dfrac{1}{2}$

(e) $y = \dfrac{1}{4}x$

22. If f is a function such that

$$f''(x) = 2, \quad f'(2) = 5; \quad f(2) = 10$$

then $f(1) =$

(a) 6 ————————————————————————————(correct)

(b) 8

(c) 15

(d) 17

(e) 7

23. $\int \left(\dfrac{2}{x} + \sec^2 x \right) dx =$

    (a) $2 \ln |x| + \tan x + c$ _____(correct)

    (b) $2 \ln |x| + \sec x + c$

    (c) $2 \ln |x| + \sec x \tan x + c$

    (d) $2 + 2 \sec x + c$

    (e) $\dfrac{-2}{x^2} + \tan x + c$

24. $\int \dfrac{x+1}{\sqrt{x}} \, dx =$

    (a) $\dfrac{2}{3} x^{3/2} + 2\sqrt{x} + c$ _____(correct)

    (b) $x^{\frac{3}{2}} + \sqrt{x} + c$

    (c) $2(x+1)^2 \sqrt{x} + c$

    (d) $\dfrac{1}{2}(x+1)^2 + 2\sqrt{x} + c$

    (e) $x^{\frac{3}{2}} + \sqrt{x} + c$

25. $\dfrac{\cosh^2 0.1 - \sinh^2 0.1}{\tanh^2 0.2 + \text{sech}^2 0.2} =$

    (a) 1 ————————————————————————————————(correct)

    (b) 0.5

    (c) 2

    (d) -0.5

    (e) -1

26. $\frac{d^2}{dx^2}\left(2\cosh(\ln x)\right) =$

    (a) $\dfrac{2}{x^3}$ ————————————————————————————(correct)

    (b) $1 - \dfrac{1}{x^3}$

    (c) $1 + \dfrac{1}{x^2}$

    (d) $1 + \dfrac{2}{x^3}$

    (e) $1 - \dfrac{2}{x^3}$

27. Using differential, the value of $\sqrt[3]{999.4}$ approximately equals

    (a) 9.998 ——————————————————————————————————(correct)

    (b) 9.98

    (c) 9.994

    (d) 9.94

    (e) 9.996

28. The number of the relative extrema of the function $f(x) = -3x^5 + 5x^3$ is

    (a) 2 ——————————————————————————————————(correct)

    (b) 3

    (c) 4

    (d) 1

    (e) 0

Q	MASTER	CODE01	CODE02	CODE03	CODE04
1	A	A $_{15}$	B $_4$	B $_{20}$	D $_{27}$
2	A	D $_3$	B $_5$	A $_{21}$	B $_{26}$
3	A	B $_{23}$	D $_{15}$	D $_{27}$	D $_{12}$
4	A	A $_{20}$	D $_{16}$	B $_{16}$	D $_{10}$
5	A	C $_{13}$	D $_{21}$	E $_{17}$	D $_{22}$
6	A	E $_{11}$	A $_{19}$	D $_{12}$	A $_{15}$
7	A	C $_6$	B $_{20}$	E $_{18}$	E $_{18}$
8	A	C $_{18}$	B $_8$	C $_1$	B $_{17}$
9	A	B $_{17}$	D $_{11}$	D $_{15}$	A $_6$
10	A	D $_{14}$	E $_{12}$	D $_3$	A $_4$
11	A	B $_2$	E $_{27}$	A $_{11}$	C $_{20}$
12	A	A $_{26}$	E $_{13}$	D $_{13}$	A $_2$
13	A	B $_{12}$	B $_2$	B $_{14}$	A $_{11}$
14	A	C $_{19}$	A $_{28}$	C $_8$	D $_{23}$
15	A	C $_{28}$	D $_{23}$	A $_9$	A $_5$
16	A	C $_{21}$	C $_9$	A $_4$	D $_{14}$
17	A	B $_7$	C $_1$	C $_{22}$	D $_{16}$
18	A	A $_5$	E $_3$	E $_2$	E $_{24}$
19	A	D $_{16}$	D $_{24}$	D $_{28}$	B $_{13}$
20	A	A $_4$	C $_6$	C $_{26}$	B $_9$
21	A	C $_{22}$	D $_7$	B $_7$	E $_{28}$
22	A	C $_{24}$	D $_{10}$	A $_6$	E $_{25}$
23	A	D $_9$	E $_{18}$	D $_5$	B $_{21}$
24	A	E $_{27}$	A $_{26}$	D $_{10}$	C $_7$
25	A	C $_{25}$	C $_{22}$	E $_{25}$	D $_3$
26	A	D $_{10}$	C $_{17}$	E $_{24}$	A $_8$
27	A	B $_1$	E $_{25}$	C $_{23}$	D $_{19}$
28	A	D $_8$	D $_{14}$	D $_{19}$	A $_1$