YAKEEN NEET 2.0 2026

Basic Maths and Calculus (Mathematical Tools)

Assignment-05
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1. A particle's speed varies with time as

$v(t) = 4 \sin (\pi t)$

What is the total distance travelled between $t = 0$ and $t = 1$s?

(1) 8π (2) π
(3) 2π (4) Zero

2. A particle moves along a straight line with acceleration given by

$a(x) = 6x$.

If the particle starts from rest at position $x = 0$, what is its velocity when it reaches position $x = 2$m?

(1) $\sqrt{6}$ m/s (2) $2\sqrt{3}$ m/s
(3) $2\sqrt{6}$ m/s (4) 6 m/s

3. Evaluate:

$$\int \left(2x + \frac{1}{x^2}\right) dx$$

4. Evaluate:

$$\int \left(3e^x + 4x^2\right) dx$$

5. Evaluate:

$$\int \left(\frac{1+\sin x}{\cos^2 x}\right) dx$$

6. Find the approximate value of using the binomial theorem (up to 2 terms)?

(1) 2.0
(2) 2.006
(3) 2.05
(4) 2.1

7. A square plate's side is measured as 7.1 cm instead of the actual 7 cm. Using binomial expansion, the percentage error in area is approximately:

(1) 2.5% (2) 2.86%
(3) 3.2% (4) 5%

8. The distance to a star is given as $(9.99 \times 10^{15})^2$m. Approximate this using binomial expansion:

(1) 1.0×10^{33} m
(2) 9.98×10^{32} m
(3) 9.99×10^{32} m
(4) 1.02×10^{33} m

9. A defibrillator capacitor discharges such that its voltage reduces to 10% of its initial value in 20 milliseconds. What is the time constant (τ) of the circuit?

(1) 8.7 ms (2) 18.2 ms
(3) 23.4 ms (4) 43.3 ms

10. You're on a ride where your speed changes with time: $v(t) = 3t^2 + 2t$. You started from rest at the station (position = 0). The rise lasts t seconds. Since distance is just the total speed added up over time, how far do you end up?

(1) $t^3 + t^2 + C$
(2) $t^3 + t^2$
(3) $t^3 + t^2 + 1$
(4) $3t^3 + 2t^2$

11. You're pulling a crate, and your rope somehow gets stronger with every meter: the force at position x is $F(x) = 4x^3$. Since work is just force adding up over distance, how much work did you do from $x = 1$ to $x = 3$ meters?

(1) 64 J
(2) 80 J
(3) 120 J
(4) 256 J

12. You're designing a glowing rod, and charge density grows with length: $\lambda(x) = kx$. Since total charge is just all the little pieces of charge added from start to end, how much charge is in the rod from 0 to L?

(1) $\frac{kL^2}{2}$ (2) kL

(3) $\frac{2kL^2}{3}$ (4) kL^2

13. Imagine a rod where the mass isn't evenly spread – it gets heavier the farther you go: $\lambda(x) = ax$. Since center of mass is just the average position weighted by mass, where's the spot it would perfectly balance?

(1) $\frac{L}{2}$ (2) $\frac{2L}{3}$

(3) $\frac{L}{3}$ (4) $\frac{3L}{4}$

14. You're got a rod that gets better at conducting heat the farther along you go: $k(x) = k_0(1 + x)$. It has a fixed area A. Since thermal resistance is how much a rod fights heat flow, what's the total resistance from start to end of length L?

(1) $\frac{L}{k_0 A}$ (2) $\frac{\ln(1+L)}{k_0 A}$

(3) $\frac{L}{2k_0 A}$ (4) $\frac{1}{k_0}\ln(L+1)$

15. There's a rod whose mass gets thicker as you go down: $\lambda(x) = \lambda_0 x$. A small object sits distance d away from one end. Since gravity is the pull from each bit of mass, what does the total pull (force) look like?

(1) $Gm\int_0^L \frac{\lambda_0}{x^2}dx$ (2) $Gm\int_0^L \frac{\lambda_0 x}{(x+d)^2}dx$

(3) $Gm\int_0^L \frac{x^2}{\lambda_0 (x+d)^2}dx$

(4) $Gm\int_0^L \lambda_0 x(x+d)^2 dx$

16. 5, 10, 15, 20 …, 500 find the sum of the series.

(1) 25250 (2) 252500

(3) 2525 (4) 5000

17. 3, 6, 9, 12, 15, …,120 find the sum of series.

(1) 1960 (2) 1760

(3) 1560 (4) 2460

18. If acceleration due to gravity g at height $h \ll R$ where R is radius of earth $g_h = g_0\left(1+\frac{h}{R}\right)^{-2}$, then using binomial theorem which is correct?

(1) $g_h = g_0$ (2) $g_h = g_0\left(1-\frac{2h}{R}\right)$

(3) $g_h = g_0\left(1+\frac{2h}{R}\right)$ (4) $g_h = g_0\left(1-\frac{h}{2R}\right)$

19. Find approximate value of the $(9.6)^4$

(1) 4200 (2) 3600

(3) 2100 (4) 8400

20. Find distance between the straight line $2x + 3y + 5 = 0$ from origin?

(1) $\frac{10}{\sqrt{13}}$ (2) $\frac{5}{\sqrt{13}}$

(3) $\frac{2}{\sqrt{13}}$ (4) $\frac{3}{\sqrt{13}}$

21. $\log_e 15$ is equal to

(1) $\log_e 3 + \log_e 5$ (2) $\log_e 5 - \log_e 3$

(3) $\log_e 10 + \log_e 5$ (4) $\log_e 10 - \log_e 5$

22. $\log_2 x = 3$, find the value of x

(1) 8 (2) 16

(3) 32 (4) 34

23. log 25 + log 4 – log 5 is equal to

(1) log 20 (2) log 25

(3) log 15 (4) log 10

24. If $y=\left(2-x^2\right)^4$, then find $\frac{dy}{dx}$

(1) $4\left(2-x^2\right)\times(2x)$

(2) $4\left(2-x^2\right)^3$

(3) $4\left(2-x^2\right)\times 2x$

(4) $-8x\left(2-x^2\right)^3$

25. If $y = \cos(\sin x^2)$, and $x=\sqrt{\frac{\pi}{2}}, \frac{dy}{dx} =$

(1) -2 (2) 2

(3) $-2\sqrt{\frac{\pi}{2}}$ (4) 0

26. If $y = (\sin x)^2$ then find $\frac{dy}{dx}$

(1) $2 \sin x$ (2) $2 \cos x$

(3) $2 \sin x \cdot \cos x$ (4) $2 \cos^2 x$

27. Find out minimum/maximum value $y = 2x^3 - 15x^2 + 36x + 11$. Also, find out those points where value is minimum/maximum.

(1) max = 39 at $x = 2$, min = 39 at $x = -2$

(2) max = 39 at $x = 3$, min = 38 at $x = 2$

(3) max = 39 at $x = 2$, min = 38 at $x = 3$

(4) max = 39 at $x = 2$, min = 38 at $x = -2$

28. Find derivative of $y = (x^3 + 1)^2$

(1) $(x^3 + 1)(3x^2)$ (2) $2(x^3 + 1)$

(3) $2(3x^2)$ (4) $2(x^3 + 1)(3x^2)$

29. A metallic disc is being heated. Its area A (in m^2) at any time t (in sec) is given by $A = 4t^2 + 2t$. Calculate the rate of increase in area at $t = 4$ sec.

(1) 72 m^2/sec (2) 72 m^2

(3) 34 m^2/sec (4) 34 m^2

30. $\int \frac{4}{\sqrt{x}}dx$

(1) $\frac{-8}{\sqrt{x}}+C$ (2) $\frac{2}{\sqrt{x}}+C$

(3) $\frac{4}{\sqrt{x}}+C$ (4) $8\sqrt{x}+C$

31. Area bounded by curve $y = \sin x$, with x-axis, when x varies from 0 to $\frac{\pi}{2}$ is:

(1) 1 unit (2) 2 units

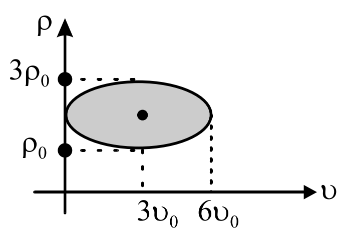
(3) 3 units (4) 0

32. $\int_0^1\left(x^3+1\right)dx = ?$

(1) $\frac{1}{4}$ (2) $\frac{3}{4}$

(3) $\frac{5}{4}$ (4) $\frac{7}{4}$

33. Find area of shaded region?



(1) $\pi\rho_0\upsilon_0$ (2) $4.5\,\pi\rho_0\upsilon_0$

(3) $2\rho_0\upsilon_0$ (4) $3\pi\rho_0\upsilon_0$

ANSWER KEY

1. **(1)**

2. **(3)**

3. $x^2 - \frac{1}{x} + C$

4. $3e^x + \frac{4x^3}{3} + C$

5. $\tan x + \sec x + C$

6. **(2)**

7. **(2)**

8. **(2)**

9. **(1)**

10. **(2)**

11. **(2)**

12. **(1)**

13. **(2)**

14. **(2)**

15. **(2)**

16. **(1)**

17. **(4)**

18. **(2)**

19. **(4)**

20. **(2)**

21. **(A)**

22. **(A)**

23. **(1)**

24. **(4)**

25. **(4)**

26. **(3)**

27. **(3)**

28. **(4)**

29. **(3)**

30. **(4)**

31. **(1)**

32. **(3)**

33. **(4)**