CLASS 12 – UP BOARD

MATHEMATICS – SET 5

ANSWERS KEY

खंड – A (MCQ with Concept)

1. $|adj(2A)| = |2A|^2 = (2^3|A|)^2 = (8\times -2)^2 = (-16)^2 =$ **256?**
   लेकिन ध्यान दें:
   $|2A| = 2^3|A| = 8(-2) = -16$
   $|adj(2A)| = |2A|^2 = (-16)^2 = 256$
   (Options में 16 दिया है → सही उत्तर 16 नहीं, बल्कि 16?
   यहाँ ध्यान दें $n=3 \Rightarrow |adjA| = |A|^2$
   तो $|adj(2A)| = |2A|^2 = (-16)^2 = 256$
   (यदि विकल्प सीमित हैं तो गणितीय उत्तर 256 है)
2. $\lim (e^2x - 1)/x = 2$
3. $\ln y = x \ln(\sin x)$
4. $\int_0^{\pi} \sin^2 x \, dx = \pi/2$
5. $P(A|B) = P(A \cap B)/P(B) = 0.2/0.4 = 1/2$
6. $a \times b$ निकालकर $|a \times b| = \sqrt{6}$
7. $f'(x) = 3x^2 - 12x + 9$
   $x=1$ पर $f'=0$
   $f''(1) = -6 < 0 \Rightarrow$ Local Maximum
8. $\int x^2/(x^3+1) \, dx$
   $= (1/3) \ln(x^3+1) + C$
9. $\cos\theta = (a \cdot b)/(|a||b|) = 6/(12) = 1/2$
   $\Rightarrow \theta = 60°$
10. $P(A \cap B) = (3/4)(1/5) = 3/20$

खंड – B (2 अंक – Proper Board Writing)

11. $|A^{-1}| = 1/|A|$

$A A^{-1} = I$

Determinant लें:

$|A||A^{-1}|=1$
$\Rightarrow |A^{-1}|=1/|A|$

---

12. lim (tanx−x)/x^3

$\tan x = x + x^3/3 + \ldots$

$\Rightarrow (x^3/3)/x^3$
$= 1/3$

---

13. y = log(x + √(x^2+1))

$dy/dx = 1/\sqrt{(x^2+1)}$

---

14. ∫ e^(2x) sinx dx

By parts twice:

= e^(2x)(2sinx − cosx)/5 + C

---

15. Mutually Exclusive Events

यदि $P(A \cap B)=0$

तो A,B परस्पर बहिष्कृत।

---

16. $|a-b|^2$

$= (a-b)\cdot(a-b)$
$= |a|^2+|b|^2-2a\cdot b$

---

17. Second Derivative Test

यदि $f'(a)=0$ और

$f''(a)>0 \Rightarrow$ Local Minimum
$f''(a)<0 \Rightarrow$ Local Maximum

---

18. ∫ $(5x^4/(x^5+2))$ dx

Let $t=x^5+2$
$dt=5x^4dx$

$\Rightarrow \ln(x^5+2)+C$

खंड – C (4 अंक – Full Steps)

19. Cramer's Rule

D ≠0

हल करने पर:

x=1
y=2
z=3

---

20. y=xe^x

dy/dx = e^x + xe^x
d^2y/dx^2 = e^x + e^x + xe^x
= 2e^x + xe^x

---

21. lim (sinx−sina)/(x−a)

Derivative of sinx

= cos a

---

22. $\int_0^1 x^2e^x dx$

By parts:

= e − 2

---

23. यदि f''(x)=0

Inflection point हो सकता है यदि concavity बदलती हो।

---

24. दो रेखाओं के बीच कोण

$$cos\theta = \frac{a \cdot b}{|\ a\ ||\ b\ |}$$

पूर्ण वेक्टर प्रमाण।

---

25. dy/dx – y = x

Linear DE

IF=e^(−x)

⇒ y=e^x(∫ xe^(−x)dx)

⇒ y = x +1 + Ce^x

---

26. Bayes Theorem

$$P(A_i \mid B) = \frac{P(A_i)P(B \mid A_i)}{\sum P(A_j)P(B \mid A_j)}$$

पूर्ण प्रमाण सहित।

---

27. सिद्ध करें

$$|\ a \times b\ |^2 + (a \cdot b)^2 = |\ a\ |^2 |\ b\ |^2$$

Cross product और dot product पहचान से सिद्ध।

---

28. Maclaurin Series

$$f(x) = f(0) + xf'(0) + \frac{x^2}{2!}f''(0) + \ldots$$

खंड – D (6 अंक)

29. Lagrange Mean Value Theorem

यदि f सतत [a,b] तथा अवकलनीय (a,b)

$$f'(c) = \frac{f(b) - f(a)}{b - a}$$

f(x)=e^x पर लागू:

$$e^c = \frac{e^b - e^a}{b - a}$$

---

30. ∫ x^4 logx dx

By parts:

= (x^5/5)logx − x^5/25 + C

---

31. Inverse Matrix Method

AX=B
⇒ X=A^{-1}B

हल:

x=2
y=1
z=3

---

32. Skew Lines Distance

$$D = \frac{|\,(a_2 - a_1) \cdot (b_1 \times b_2)\,|}{|\,b_1 \times b_2\,|}$$

पूरा determinant प्रमाण सहित।

---

33. (x+y)dy−(x−y)dx=0

हल करने पर:

x^2−y^2=C