DAE / IA - 2019

MATH - 233 APPLIED MATHEMATICS - II

PAPER 'A' PART - A (OBJECTIVE)

Time : 30 Minutes Marks : 15

Q.1: *Encircle the correct answer.*

1. $\lim_{x\to 3}\sqrt{25-x^2}$

[a] 5 [b] 3 [c] 4 [d] 0

2. $\lim_{x\to \frac{\pi}{3}}(\cos x)=?$

[a] $\sqrt{3}/2$ [b] $1/2$ [c] 0 [d] $1/\sqrt{2}$

3. Derivative of $3x^2+x^{-1/2}$ w.r.t. x is:

[a] $6x+\frac{1}{2}x^{-1/2}$ [b] $6x-\frac{1}{2}x^{-1/2}$

[c] $6x-\frac{1}{2}x^{1/2}$ [d] $6x+\frac{1}{2}x^{-1/2}$

4. Derivative x^2-x^{-2} w.r.t. x is:

[a] $2x-2x^{-2}$ [b] $2x+2x^{-3}$

[c] $2x-4x^{-2}$ [d] $2x-2x^{-3}$

5. If $u=t^2-3$ then $\frac{du}{dt}=?$

[a] $2t$ [b] $2t-3$ [c] t^{-2} [d] $2t^{-2}$

6. $\frac{d}{dx}(\sec 3x)=?$

[a] $3\sec 3x\tan 3x$ [b] $\sec 3x\tan 3x$

[c] $3\sec 3x\cot 3x$ [d] $-3\sec 3x\tan 3x$

7. $\frac{d}{dx}(\sin^{-1}x)=?$

[a] $\frac{1}{\sqrt{x^2-1}}$ [b] $\frac{-1}{\sqrt{1-x^2}}$

[c] $\frac{\sin^{-1}x}{\sqrt{1-x^2}}$ [d] $\frac{1}{\sqrt{1-x^2}}$

8. $\frac{d}{dx}\sin^{-1}(\sqrt{x})=?$

[a] $\frac{1}{\sqrt{1-x^2}}$ [b] $\frac{1}{\sqrt{1+x^2}}$

[c] $\frac{1}{2\sqrt{x}}\frac{1}{\sqrt{1-x}}$ [d] $\frac{1}{2\sqrt{x}}\frac{1}{1+x}$

9. $\frac{d}{dx}\left(\sin^{-1}\frac{1}{x}\right)=?$

[a] $\frac{1}{\sqrt{1-x^2}}$ [b] $\frac{-1}{x\sqrt{x^2-1}}$

[c] $\frac{1}{x\sqrt{x^2-1}}$ [d] $\frac{-1}{\sqrt{x^2-1}}$

10. If $\frac{dy}{dx}$ does not change sign before and after a point where it vanished then that is point of:

[a] Maxima [b] Minima

[c] Inflection [d] None of these

11. A function is maximum at a point if $\frac{dy}{dx}$ change sign from:

[a] $+$ve to $-$ve [b] $-$ve to $+$ve

[c] does not change sign [d] zero

12. A quantity whose value remains fixed is called;

[a] Constant [b] Variable

[c] Parameter [d] Function

13. Mean, Median and Mode are the types of:

[a] Average [b] Function

[c] Variable [d] Constant

14. The probability of occurring one when a perfect die is rolled:

[a] $\frac{5}{6}$ [b] $\frac{2}{3}$ [c] $\frac{1}{3}$ [d] $\frac{1}{6}$

15. From a well shuffled pack of 5 2 cards, a card is drawn at random, the probability that it is king card:

[a] $\frac{1}{13}$ [b] $\frac{1}{26}$ [c] $\frac{1}{14}$ [d] $\frac{1}{52}$

Answer Key

1	c	2	b	3	b	4	b	5	a
6	a	7	d	8	c	9	c	10	c
11	a	12	a	13	a	14	d	15	a

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DAE / IA - 2019

MATH - 233 APPLIED MATHEMATICS - II

PAPER 'B' PART - B (SUBJECTIVE)

Time : 2 : 30Hrs Marks : 60

Section - I

Q.1. Write short answers to any Eighteen (18) questions.

1. Fid the value of $\lim\limits_{x\to 2}\dfrac{x^3-8}{x^2-3x+2}$

Sol. $\lim\limits_{x\to 2}\dfrac{x^3-8}{x^2-3x+2}\ \left(\dfrac{0}{0}\right)\text{form}$

$$=\lim_{x\to 2}\frac{(x)^3-(2)^3}{x^2-2x-x+2}$$

$$=\lim_{x\to 2}\frac{(x-2)(x^2+2x+4)}{x(x-2)-1(x-2)}$$

$$=\lim_{x\to 2}\frac{\cancel{(x-2)}(x^2+2x+4)}{\cancel{(x-2)}(x-1)}$$

$$=\lim_{x\to 2}\frac{(x^2+2x+4)}{(x-1)}$$

$$=\frac{(2)^2+2(2)+4}{2-1}$$

$$=\frac{4+4+4}{1}=\boxed{12}$$

2. Find the value of $\lim\limits_{x\to 1}\dfrac{x^2+x-2}{x^2-x}$

Sol. $\lim\limits_{x\to 1}\dfrac{x^2+x-2}{x^2-x}\ \left(\dfrac{0}{0}\right)\text{form}$

$$=\lim_{x\to 1}\frac{x^2+2x-x-2}{x(x-1)}$$

$$=\lim_{x\to 1}\frac{x(x+2)-1(x+2)}{x(x-1)}$$

$$=\lim_{x\to 1}\frac{(x+2)(x-1)}{x(x-1)}$$

$$=\lim_{x\to 1}\frac{x+2}{x}=\frac{1+2}{1}=\frac{3}{1}=\boxed{3}$$

3. Find: $\lim\limits_{x\to 0}\dfrac{\sqrt{1+x}-1}{x}$

Sol. $\lim\limits_{x\to 0}\dfrac{\sqrt{1+x}-1}{x}\ \left(\dfrac{0}{0}\right)\text{form}$

$$=\lim_{x\to 0}\frac{\sqrt{1+x}-1}{x}\times\frac{\sqrt{1+x}+1}{\sqrt{1+x}+1}$$

$$=\lim_{x\to 0}\frac{\left(\sqrt{1+x}\right)^2-(1)^2}{x\left(\sqrt{1+x}+1\right)}$$

$$=\lim_{x\to 0}\frac{\cancel{1}+x-\cancel{1}}{x\left(\sqrt{1+x}+1\right)}$$

$$=\lim_{x\to 0}\frac{x}{x\left(\sqrt{1+x}+1\right)}$$

$$=\lim_{x\to 0}\frac{1}{\sqrt{1+x}+1}=\frac{1}{\sqrt{1+0}+1}$$

$$=\frac{1}{\sqrt{1}+1}=\frac{1}{1+1}=\boxed{1/2}$$

4. Find the value of $\lim\limits_{x\to 0}\dfrac{\sqrt{4+x}-2}{x}$

Sol. $\lim\limits_{x\to 0}\dfrac{\sqrt{4+x}-2}{x}\ \left(\dfrac{0}{0}\right)\text{form}$

$$=\lim_{x\to 0}\frac{\left(\sqrt{4+x}\right)^2-(2)^2}{x\left(\sqrt{4+x}+2\right)}$$

$$=\lim_{x\to 0}\frac{\cancel{4}+x-\cancel{4}}{x\left(\sqrt{4+x}+2\right)}$$

$$=\lim_{x\to 0}\frac{x}{x\left(\sqrt{4+x}+2\right)}$$

$$=\lim_{x\to 0}\frac{1}{\sqrt{4+x}+2}=\frac{1}{\sqrt{4+0}+2}$$

$$=\frac{1}{\sqrt{4}+2}=\frac{1}{2+2}=\boxed{\frac{1}{4}}$$

5. ~~Find $\dfrac{dy}{dx}$ if $x=t+2,\ y=2t^2+2$~~

Sol. Differentiate both sides w.r.t. 't' :

$$\frac{d}{dt}(x)=\frac{d}{dt}(t+2) \quad \Bigg| \quad \frac{d}{dt}(y)=\frac{d}{dt}(2t^2+2)$$

$$\frac{dx}{dt}=1+0=1 \quad \Bigg| \quad \frac{dy}{dt}=2(2t)+0=4t$$

using chain rule : $\frac{dy}{dx}=\frac{dy}{dt}\times\frac{dt}{dx}$

$$\frac{dy}{dx}=(4t)(1) \Rightarrow \boxed{\frac{dy}{dx}=4t}$$

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6. ~~Find $\frac{dy}{dx}$ if $x=\theta^2-\theta-1,\ y=2\theta^2+\theta+1$~~

Sol. Differentiate both sides w.r.t. 'θ' :

$$\frac{d}{d\theta}(x)=\frac{d}{d\theta}(\theta^2-\theta-1) \quad \Bigg| \quad \frac{d}{d\theta}(y)=\frac{d}{d\theta}(2\theta^2+\theta+1)$$

$$\frac{dx}{d\theta}=2\theta-1-0 \quad \Bigg| \quad \frac{dy}{d\theta}=2(2\theta)+1+0$$

$$\frac{d\theta}{dx}=\frac{1}{2\theta-1} \quad \Bigg| \quad \frac{dy}{d\theta}=4\theta+1$$

using chain rule : $\frac{dy}{dx}=\frac{dy}{d\theta}\times\frac{d\theta}{dx}$

$$\frac{dy}{dx}=(4\theta+1)\left(\frac{1}{2\theta-1}\right)=\boxed{\frac{4\theta+1}{2\theta-1}}$$

---

7. ~~Find $\frac{dy}{dx}$ if $x=u+\frac{1}{u},\ y=u-\frac{1}{u}$~~

Sol. As, $x=u+\frac{1}{u}$ & $y=u-\frac{1}{u}$

Differentiate both sides w.r.t. 'u':

$$\frac{d}{du}(x)=\frac{d}{du}\left(u+\frac{1}{u}\right) \quad \Bigg| \quad \frac{d}{du}(y)=\frac{d}{du}\left(u-\frac{1}{u}\right)$$

$$\frac{dx}{du}=\frac{d}{du}(u+u^{-1}) \quad \Bigg| \quad \frac{dy}{du}=\frac{d}{du}(u-u^{-1})$$

$$\frac{dx}{du}=1+(-1)u^{-2} \quad \Bigg| \quad \frac{dy}{du}=1-(-1)u^{-2}$$

$$\frac{dx}{du}=1-\frac{1}{u^2}=\frac{u^2-1}{u^2} \quad \Bigg| \quad \frac{dy}{du}=1+\frac{1}{u^2}$$

$$\frac{du}{dx}=\frac{u^2}{u^2-1} \quad \Bigg| \quad \frac{dy}{du}=\frac{u^2+1}{u^2}$$

using chain rule :

$$\frac{dy}{dx}=\frac{dy}{du}\times\frac{du}{dx}=\frac{u^2+1}{\cancel{u^2}}\times\frac{\cancel{u^2}}{u^2-1}=\boxed{\frac{u^2+1}{u^2-1}}$$

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8. ~~Differentiate $\frac{x^3}{1+x^3}$ w.r.t. x^3~~

Sol. Let $y=\frac{x^3}{1+x^3}$ and $t=x^3$

Differentiate both sides w.r.t. 'x' :

$$\frac{d}{dx}(y)=\frac{d}{dx}\left(\frac{x^3}{1+x^3}\right) \{\text{using Quotient Rule}\}$$

$$\frac{dy}{dx}=\frac{(1+x^3)\left(\frac{d}{dx}(x^3)\right)-x^3\left(\frac{d}{dx}(1+x^3)\right)}{(1+x^3)^2}$$

$$\frac{dy}{dx}=\frac{(1+x^3)(3x^2)-x^3(0+3x^2)}{(1+x^3)^2}$$

$$\frac{dy}{dx}=\frac{3x^2+3x^5-3x^5}{(1+x^3)^2}=\frac{3x^2}{(1+x^3)^2}$$

$$\frac{d}{dx}(t)=\frac{d}{dx}(x^3)$$

$$\frac{dt}{dx}=3x^2 \Rightarrow \frac{dx}{dt}=\frac{1}{3x^2}$$

using chain rule :

$$\frac{dy}{dt}=\frac{dy}{dx}\times\frac{dx}{dt}=\frac{3x^2}{(1+x^3)^2}\times\frac{1}{3x^2}=\boxed{\frac{1}{(1+x^3)^2}}$$

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9. ~~Differentiate $\frac{x^2}{1+x^2}$ w.r.t. x^2.~~

Sol. Let, $y=\frac{x^2}{1+x^2}$ and $t=x^2$

Differentiate both sides w.r.t. 'x' :

$$\frac{d}{dx}(y)=\frac{d}{dx}\left(\frac{x^2}{1+x^2}\right) \{\text{using Quotient Rule}\}$$

$$\frac{dy}{dx}=\frac{(1+x^2)\frac{d}{dx}(x^2)-x^2\frac{d}{dx}(1+x^2)}{(1+x^2)^2}$$

$$\frac{dy}{dx}=\frac{(1+x^2)(2x)-x^2(0+2x)}{(1+x^2)^2}$$

$$\frac{dy}{dx}=\frac{2x+2x^3-2x^3}{(1+x^2)^2} \Rightarrow \frac{dy}{dx}=\frac{2x}{(1+x^2)^2}$$

$$\frac{d}{dx}(t)=\frac{d}{dx}(x^2)$$

$$\frac{dt}{dx}=2x \Rightarrow \frac{dx}{dt}=\frac{1}{2x}$$

using chain rule: $\frac{dy}{dt}=\frac{dy}{dx}\times\frac{dx}{dt}$

$$\frac{dy}{dt}=\frac{2x}{(1+x^2)^2}\times\frac{1}{2x}=\boxed{\frac{1}{(1+x^2)^2}}$$

10. ~~Show that if $x=a\theta^2$, $y=2a\theta$ then $y\frac{dy}{dx}-2a=0$.~~

Sol. As, $x=a\theta^2$ & $y=2a\theta$

Differentiate both sides w.r.t. 'θ':

$$\frac{d}{d\theta}(x)=\frac{d}{d\theta}(a\theta^2) \qquad \frac{d}{d\theta}(y)=\frac{d}{d\theta}(2a\theta)$$

$$\frac{dx}{d\theta}=a(2\theta)=2a\theta \qquad \frac{dy}{d\theta}=2a(1)$$

$$\frac{d\theta}{dx}=\frac{1}{2a\theta} \qquad \frac{dy}{d\theta}=2a$$

using chain rule:

$$\frac{dy}{dx}=\frac{dy}{d\theta}\times\frac{d\theta}{dx}=(2a)\left(\frac{1}{2a\theta}\right)=\frac{1}{\theta}$$

$$\text{L.H.S.}=y\frac{dy}{dx}-2a$$

$$=2a\theta\left(\frac{1}{\theta}\right)-2a$$

$$=2a-2a=0=\text{R.H.S.}$$ **Proved.**

11. **Differentiate $\cos^2(ax+b)$ w.r.t. 'x'.**

Sol. $\frac{d}{dx}\left(\cos^2(ax+b)\right)$

$$=2\cos(ax+b)\left(\frac{d}{dx}\cos(ax+b)\right)$$

$$=2\cos(ax+b).(-\sin(ax+b))\left(\frac{d}{dx}(ax+b)\right)$$

$$=-2\sin(ax+b)\cos(ax+b).(a(1)+0)$$

$$=\boxed{-a\sin 2(ax+b)}$$

12. **Differentiate $\operatorname{cosec}^2 3x$ w.r.t. 'x'.**

Sol. $\frac{d}{dx}\left(\operatorname{cosec}^2 3x\right)$

$$=2\operatorname{cosec}3x\left(\frac{d}{dx}(\operatorname{cosec}3x)\right)$$

$$=2\operatorname{cosec}3x(-\operatorname{cosec}3x\cot 3x)\frac{d}{dx}(3x)$$

$$=-2\operatorname{cosec}^2 3x\cot 3x(3(1))$$

$$=\boxed{-6\operatorname{cosec}^2 3x\cot 3x}$$

13. **Differentiate $\sec\sqrt{a+bx}$ w.r.t. 'x'.**

Sol. $\frac{d}{dx}\left(\sec\sqrt{a+bx}\right)$

$$=\sec\sqrt{a+bx}\tan\sqrt{a+bx}\frac{d}{dx}\left(\sqrt{a+bx}\right)$$

$$=\sec\sqrt{a+bx}\tan\sqrt{a+bx}\times\frac{1}{2}(a+bx)^{-1/2}\frac{d}{dx}(a+bx)$$

$$=\sec\sqrt{a+bx}\tan\sqrt{a+bx}\times\frac{1}{2\sqrt{a+bx}}(0+b(1))$$

$$=\boxed{\frac{b\sec\sqrt{a+bx}\tan\sqrt{a+bx}}{2\sqrt{a+bx}}}$$

14. **Differentiate $\sin(\tan x)$ w.r.t. 'x'.**

Sol. $\frac{d}{dx}[\sin(\tan x)]$

$$=\cos(\tan x).\left(\frac{d}{dx}(\tan x)\right)$$

$$=\boxed{\cos(\tan x)\sec^2 x}$$

15. **Differentiate $\cot^3(3x+1)$**

Sol. $\frac{d}{dx}\left(\cot^3(3x+1)\right)$

$$=3\cot^2(3x+1)\left(\frac{d}{dx}\left(\cot(3x+1)\right)\right)$$

$$=3\cot^2(3x+1).\left(-\operatorname{cosec}^2(3x+1)\right)\left(\frac{d}{dx}(3x+1)\right)$$

$$=-3\cot^2(3x+1)\operatorname{cosec}^2(3x+1)\left(3(1)+0\right)$$

$$=\boxed{-9\cot^2(3x+1)\operatorname{cosec}^2(3x+1)}$$

16. **Differentiate $\sin\left[\sin(\cos x)\right]$ w.r.t. 'x'.**

Sol. $\frac{d}{dx}\left[\sin\left[\sin(\cos x)\right]\right]$

$$=\cos\left[\sin(\cos x)\right]\frac{d}{dx}\left[\sin(\cos x)\right]$$

$$=\cos\left[\sin(\cos x)\right].\left[\cos(\cos x)\right].\frac{d}{dx}(\cos x)$$

$$=\cos\left[\sin(\cos x)\right]\left[\cos(\cos x)\right].(-\sin x)$$

$$=\boxed{-\cos\left[\sin(\cos x)\right]\left[\cos(\cos x)\right]\left[\sin x\right]}$$

17. **Find the derivative of $x^2\tan x$.**

Sol. $\frac{d}{dx}\left(x^2\tan x\right)$ {using Product Rule}

$$=\left(\frac{d}{dx}(x^2)\right)\tan x+x^2\left(\frac{d}{dx}(\tan x)\right)$$

$$=\boxed{2x\tan x+x^2\sec^2 x}$$

18. **Find the turning (or critical point of the curve $y=\sin 2x$ between 0 and $\frac{\pi}{2}$.**

Sol. $y=\sin 2x$

Differentiate both sides w.r.t. 'x':

$$\frac{d}{dx}(y)=\frac{d}{dx}(\sin 2x)$$

$$\frac{dy}{dx}=\cos 2x(2)$$

$$\frac{dy}{dx}=2\cos 2x$$

For turning points, put $\frac{dy}{dx}=0$

$$2\cos 2x=0$$

$$\cos 2x=0$$

$$2x=\cos^{-1}(0)$$

$$2x=\frac{\pi}{2}\Rightarrow \boxed{x=\frac{\pi}{4}}$$

19. **Find the turning points of the curve $y=x^2-3x+3$.**

Sol. $y=x^2-3x+3$

Differentiate both sides w.r.t. 'x':

$$\frac{d}{dx}(y)=\frac{d}{dx}\left(x^2-3x+3\right)$$

$$\frac{dy}{dx}=2x-3$$

For turning points, put $\frac{dy}{dx}=0$

$$2x-3=0$$

$$2x=3\Rightarrow \boxed{x=3/2}$$

20. **Find the turning points of the curve $y=2x^3-15x^2+36x+10$**

Sol. $y=2x^3-15x^2+36x+10$

Differentiate both sides w.r.t. 'x':

$$\frac{d}{dx}(y)=\frac{d}{dx}\left(2x^3-15x^2+36x+10\right)$$

$$\frac{dy}{dx}=2\left(3x^2\right)-15(2x)+36(1)+0$$

$$\frac{dy}{dx}=6x^2-30x+36$$

For turning point, put $\frac{dy}{dx}=0$

$$6x^2-30x+36=0$$

Dividing each term on '6'

$$x^2-5x+6=0$$

$$x^2 - 3x - 2x + 6 = 0$$
$$x(x-3) - 2(x-3) = 0$$
$$(x-3)(x-2) = 0$$

Either | OR

$x - 3 = 0$ | $x - 2 = 0$

$\boxed{x = 3}$ | $\boxed{x = 2}$

21. Find the extreme values of the function $x^2 - 4x - 6$

Sol. Let, $y = x^2 - 4x - 6 \rightarrow (i)$

Differentiate both sides w.r.t. 'x':

$$\frac{d}{dx}(y) = \frac{d}{dx}\left(x^2 - 4x - 6\right)$$
$$\frac{dy}{dx} = 2x - 4(1) - 0$$
$$\frac{dy}{dx} = 2x - 4 \quad \rightarrow (ii)$$

For critical values, put $\frac{dy}{dx} = 0$

$$2x - 4 = 0$$
$$2x = 4$$
$$x = 4/2 \Rightarrow \boxed{x = 2}$$

Differentiate eq. (ii) both sides w.r.t. 'x':

$$\frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{d}{dx}(2x - 4)$$
$$\frac{d^2y}{dx^2} = 2(1) - 0$$
$$\frac{d^2y}{dx^2} = 2 \rightarrow (iii)$$

Put $x = 2$ in eq. (iii) & eq. (i)

$$\frac{d^2y}{dx^2} = 2 > 0$$
$$y_{min} = (2)^2 - 4(2) - 6$$
$$y_{min} = 4 - 8 - 6 \Rightarrow \boxed{y_{min} = -10}$$

22. Calculate the median for 88.03, 94.50, 94.90, 95.05, 84.50

Sol. Rearrange the data in Ascending order:

84.50, 88.03, 94.05, 94.50, 94.90

$$\text{So, Median} = \left(\frac{n+1}{2}\right)^{th} \text{value}$$
$$\text{Median} = \left(\frac{5+1}{2}\right)^{th} \text{value}$$
$$\text{Median} = 3^{th} \text{ value}$$
$$\text{Hence, Median} = \boxed{94.05}$$

23. Write the formula to find median for grouped frequency distribution.

Sol. $$\text{Median} = \ell + \frac{h}{f}\left(\frac{n}{2} - c\right)$$

24. ~~Define standard deviation.~~

Sol. Let $x_1, x_2, x_3, \ldots, x_n$ be n values of a variable x, then their standard deviation is defined as:

$$S.D = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}, \; i = 1, 2, 3, \ldots, n$$

$$\text{OR } S.D. = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

25. If a dice is rolled. What is the probability that an even no divisible by 3 appears?

Sol. $S = \{1, 2, 3, 4, 5, 6\}$, $n(S) = 6$

Let B be event that an even no. is divisible by 3 is appears.

$B = \{6\}$, $n(B) = 1$

$$P(A) = \frac{n(B)}{n(S)} = \boxed{\frac{1}{6}}$$

26. If two dice are rolled, find the probability that the sum is 7.

Sol. $S=\begin{Bmatrix}(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),\\(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),\\(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),\\(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),\\(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),\\(6,1),(6,2),(6,3),(6,4),(6,5),(6,6),\end{Bmatrix}$

$n(S)=36$

Let E be event that sum of 7 appears.

$E=\begin{Bmatrix}(1,6),(2,5),(3,4),\\(4,3),(5,2),(6,1)\end{Bmatrix}$

$n(E)=6$

$\therefore P(E)=\dfrac{n(E)}{n(S)}=\dfrac{6}{36}=\boxed{\dfrac{1}{6}}$

27. **Write down the formula to find the probability of two not mutually exclusive events.**

Sol. $P(A\cup B)=P(A)+P(B)-P(A\cap B)$

Section - II

Note: Attemp any three (3) questions $3\times 8=24$

Q.2.(a) If $f(x)=\log\left(\dfrac{1-x}{1+x}\right)$, Prove that: $f(x)+f(y)=f\left(\dfrac{x+y}{1+xy}\right)$

Sol. See Q.13 of Ex # 1.1 (Page # 11)

(b) ~~Evaluate: $\lim_{\theta\to 0}\dfrac{\tan\theta-\sin\theta}{\sin^3\theta}$~~

Sol. See Q.1(x) of Ex # 1.3 (Page # 27)

Q.3.(a) ~~If $x=\dfrac{1-t^2}{1+t^2}$, $y=\dfrac{2t}{1+t^2}$ prove that $y\dfrac{dy}{dx}+x=0$~~

Sol. See Q.4(iii) of Ex # 2.3 (Page # 80)

(b) ~~Find $\dfrac{dy}{dx}$ if $x=a\left(\dfrac{t^2}{2}-t\right)$, $y=b\left(\dfrac{t^3}{3}-\dfrac{t^2}{2}\right)$~~

Sol. See Q.3(vi) of Ex # 2.3 (Page # 77)

Q.4.(a) ~~Find $\dfrac{dy}{dx}$ when $x=a(\cos t+\sin t)$, $y=a(\sin t-t\cos t)$~~

Sol. See Q.8(ii) of Ex # 3.1 (Page # 124)

(b) ~~Find the derivative of $x^x+x^{\sin x}$~~

Sol. See Q.3(vii) of Ex # 3.3 (Page # 153)

Q.5.(a) **Find the maximum and minimum (extreme) values of the function $(x-2)^3(x-3)^2$**

Sol. See Q.2(viii) of Ex # 4.2 (Page # 195)

Q.6. **Calculate A.M and median from the following data.**

Marks:

15,17,18,19,20,25,26,27,28,29, 30,31

Boys:

30,34,9,38,15,50,52,81,56,58,15, 62

Sol. See Q.3 of Ex # 5.1 (Page # 231)

(b) ~~**A die is thrown, find the probability that the dots on the top are prime numbers or odd numbers.**~~

Sol. See Q.5 of Ex # 6.2 (Page # 268)

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