Section A

1. The value of $\lim_{x \to 2} \frac{x^3 - 5}{x^2 + 5}$

a) 1

b) 0

c) $\frac{1}{3}$~

d) - 1

Solution

$\text{Lim}_{x \to 2} \frac{x^3 - 5}{x^2 + 5}$

$$= \frac{(2)^3 - 5}{(2)^2 + 5} = \frac{8 - 5}{4 + 5}$$

$$= \frac{3}{9} = \frac{1}{3}$$

The answer is C

2. The value of $\lim_{x \to 2} \frac{x - 3}{x^2 - x - 3}$

a) 0

b) 1 ~

c) $\frac{1}{3}$

d) ∞

e) $\frac{1}{4}$

Solution

$\lim_{x \to 2} \frac{x-3}{x^2-x-3}$

$= \frac{2-3}{2^2-2-3}$

$= \frac{-1}{-3} = \frac{1}{3}$

The answer is C

3. The value of$\lim_{x \to 1} \frac{x^4-27}{2x-3}$

a) 4

b) 0

c) 1

d) 26~

Solution

$$\lim_{x \to 1} \frac{x^4 - 27}{2x - 3}$$

$$= \frac{(1)^4 - 27}{2(1) - 3} = \frac{1 - 27}{2 - 3}$$

$$= \frac{-26}{-1} = 26$$

The answer is B

4. The value of $lim_{x \to \infty} \frac{46-x^3}{5x^3-3x-2}$

a) - 2

b) $-\frac{1}{5}$ ~

c) 1

d) 2

Solution

$$\lim_{x\to\infty} \frac{46 - x^3}{5x^3 - 3x - 2}$$

$$= \lim_{x \to \infty} \frac{\frac{46}{x^3} - \frac{x^3}{x^3}}{\frac{5x^3}{x^3} - \frac{3x}{x^3} - \frac{2}{x^3}}$$

$$= \lim_{x \to \infty} \frac{\frac{46}{x^3} - 1}{5 - \frac{3}{x^2} - \frac{2}{x^3}}$$

$$= \frac{0 - 1}{5 - 0 - 0} = -\frac{1}{5}$$

The answer is B

5. The value of $\lim_{x\to-3} \frac{x^2+3x-2}{x^2-3}$

a) $\frac{6}{9}$

b) $-\frac{5}{6}$

c) $\frac{2}{3}$

d) $-\frac{1}{3}$~

Solution

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

$$= \frac{(-3)^2 + 3(-3) - 2}{(-3)^2 - 3} = \frac{9 - 9 - 2}{9 - 3}$$

$$= \frac{-2}{6} = -\frac{1}{3}$$

The answer is D

6. The value of $\lim_{x \to -3} \frac{x^2+5x+6}{x+3}$ is

a) 1

b) 2

c) -2

d) -1 ~

e) 3

Solution

$$\lim_{x \to -3} \frac{x^2 + 5x + 6}{x + 3}$$

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

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

$$= -3 + 2$$

$$= -1$$

The answer is D

7. The value of $\lim_{x \to 1} \frac{x-1}{x^2 - 1}$ is

a) 2

b) $\frac{1}{3}$

c) $\frac{1}{2}$ ~

d) 1

e) -1

Solution

$$\lim_{x \to 1} \frac{x - 1}{x^2 - 1}$$

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

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

$$\frac{1}{1+1} = \frac{1}{2}$$

The answer is C

8. The value of $\lim_{x \to 8} \frac{x^2 - 4}{x+2}$ is?

a) 2

b) $\frac{1}{4}$

c) -4

d) 4

e) 6~

Solution

$$\lim_{x \to 8} \frac{x^2 - 4}{x+2}$$

$$= \lim_{x \to 8} \frac{(x-2)(x+2)}{x+2}$$

$$= \lim_{x \to 8} (x-2)$$

$$= 8 - 2 = 6$$

The answer is E

9. The value of $\lim_{x \to -3} \frac{x^2 - 4}{x-1}$ is?

a) 3

b) $\frac{1}{6}$

c) 6

d) -$\frac{5}{4}$~

Solution

$$\lim_{x \to -3} \frac{x^2 - 4}{x - 1}$$

$$= \frac{(-3)^2 - 4}{(-3) - 1} = \frac{9 - 4}{-3 - 1}$$

$$= -\frac{5}{4}$$

The **answer is D**

10. The value of $\lim_{x \to 0} \frac{\sin(ax)}{\sin(b+1)x}$ is?

a) $\frac{b}{a}$

b) $\frac{a}{b+1}$~

c) 1

d) $\frac{a}{b}$

e) 0

Solution

$$\lim_{x \to 0} \frac{\sin(ax)}{\sin(b+1)x}$$

$$= \lim_{x \to 0} \frac{\sin(ax)}{\sin(b+1)x} \cdot \frac{x}{x}$$

$$= \lim_{x \to 0} \left(\frac{\sin(ax)}{x} \cdot \frac{x}{\sin(b+1)x}\right)$$

$$= \lim_{x \to 0} \frac{\sin(ax)}{x} \cdot \lim_{x \to 0} \frac{x}{\sin(b+1)x}$$

$$= a \cdot \frac{1}{b+1} = \frac{a}{b+1}$$

The answer is B

11. $\lim_{x \to 0} \frac{2sin2x - sinx}{(cosx- \ )}$

a) 1

b) 4

c) ∞

d) $sinx$

e) 0~

Solution

$$\lim_{x\to 0}\frac{2sin2x - sinx}{(cosx-1)}$$

$$= \lim_{x\to 0}\frac{2sin2x - sinx}{(cosx-1)}\cdot\frac{x}{x}$$

$$= \lim_{x\to 0}\frac{2sin2x - sinx}{x}\cdot\frac{x}{(cosx-1)}$$

$$= \lim_{x\to 0}\left(\frac{2sin2x}{x}-\frac{sinx}{x}\right)\cdot\frac{x}{(cosx-1)}$$

$$= \lim_{x\to 0}\left(\frac{2sin2x}{x}-\frac{sinx}{x}\right)\cdot\lim_{x\to 0}\frac{x}{(cosx-1)}$$

$$= (4-2)\cdot 0 = 3\cdot 0 = 0$$

The answer is E

12. $\lim_{x\to p}\frac{x^3-p^3}{x-p}$ is?

a) 12

b) $3p^2$~

c) ∞

d) -12

Solution

$$\lim_{x\to p}\frac{x^3-p^3}{x-p}$$

lim

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$$— = — =$$

The answer is B

13. The value of $\lim_{x \to \infty} \frac{3 - x^7}{x^7 - 1}$

a) 1

b) 0

c) - 4

d) - 1~

Solution

$$\lim_{x \to \infty} \frac{3 - x^7}{x^7 - 1}$$

$$= \lim_{x \to \infty} \frac{\frac{3}{x^7} - \frac{x^7}{x^7}}{\frac{x^7}{x^7} - \frac{1}{x^7}}$$

$$= \lim_{x \to \infty} \frac{\frac{3}{x^7} - 1}{1 - \frac{1}{x^7}}$$

$$= \frac{0 - 1}{1 - 0} = \frac{-1}{1} = -1$$

The answer is D

14. The value of $\lim_{x \to \infty} \frac{4x^3 + 3}{11x^2 + 5x + 9}$

a) ∞ ~

b) $\frac{1}{4}$

c) 3

d) 0

Solution

$$\lim_{x \to \infty} \frac{4x^3 + 3}{11x^2 + 5x + 9}$$

$$= \lim_{x\to\infty} \frac{\frac{4x^3}{x^3} + \frac{3}{x^3}}{\frac{11x^2}{x^3} + \frac{5x}{x^3} + \frac{9}{x^3}}$$

$$= \lim_{x\to\infty} \frac{4 + \frac{3}{x^3}}{\frac{11}{x} + \frac{5}{x^2} + \frac{9}{x^3}}$$

$$= \frac{4+0}{0+0+0} = \frac{4}{0} = \infty$$

The answer is A

15. The value of $\lim_{x\to\infty} \frac{5x^3+2}{3x^4-2}$

a) 3

b) 1

c) ∞

d) 0 ~

Solution

$$\lim_{x\to\infty} \frac{5x^3 + 2}{3x^4 - 2}$$

$$= \lim_{x\to\infty} \frac{\frac{5x^3}{x^4} + \frac{2}{x^4}}{\frac{3x^4}{x^4} - \frac{2}{x^4}}$$

$$= \lim_{x\to\infty} \frac{\frac{5}{x} + \frac{2}{x^4}}{3 - \frac{2}{x^4}}$$

$$= \frac{0+0}{3+0} = \frac{0}{3} = 0$$

The answer is D

16. The value of $\lim_{x\to\infty} \frac{2^{-x}}{2^x}$

a) -1

b) 1

c) 0 ~

d) ∞

Solution

$$\lim_{x\to\infty}\frac{2^{-x}}{2^{x}}$$

$$=\lim_{x\to\infty}\frac{1}{2^{x}}\cdot\frac{1}{2^{x}}$$

$$=\frac{1}{\infty}\cdot\frac{1}{\infty}$$

$= 0 \cdot 0 = 0$

The answer is C

17. The value of $\lim_{x\to 0}\frac{sin5x}{x}$

a) 1

b) 5~

c) $\frac{1}{5}$

d) 0

Solution

$$\lim_{x\to 0}\frac{sin5x}{x}$$

$$=\lim_{x\to 0}\frac{sin5x}{x}\cdot\frac{5}{5}$$

$$=\lim_{x\to 0}\frac{5sin5x}{5x}$$

NOTE

$$\lim_{x\to 0}\frac{sinx}{x}=1$$

$$\Rightarrow 5\lim_{x\to 0}\frac{sin5x}{5x}$$

$$=5\cdot 1=5$$

The answer is B

18. The value of$\lim_{x\to 0}\frac{sinx}{sin3x}$

a) 3

b) $\frac{1}{3}$~

c) 0

d) $sinx$

Solution

$$\lim_{x\to 0}\frac{sinx}{sin3x}$$

$$=\lim_{x\to 0}\frac{sinx}{sin3x}\frac{3x}{3x}$$

$$=\lim_{x\to 0}(\frac{3x}{sin3x}\cdot\frac{sinx}{x}\cdot\frac{1}{3})$$

$$=\lim_{x\to 0}\frac{3x}{sin3x}\cdot\lim_{x\to 0}\frac{sinx}{x}\cdot\lim_{x\to 0}\frac{1}{3}$$

$$=1\cdot 1\cdot\frac{1}{3}=\frac{1}{3}$$

The answer is B

19. The value of $\lim_{x\to 0}\frac{tanpqx}{x}$

a) $\frac{1}{x}$

b) $\frac{pq}{x}$

c) 0

d) pq~

Solution

$$\lim_{x\to 0}\frac{tanpqx}{x}$$

$$=\lim_{x\to 0}\frac{tanpqx}{x}\cdot\frac{pq}{pq}$$

$$= \lim_{x \to 0} \frac{pqtanpqx}{pqx}$$

$$= pq \lim_{x \to 0} \frac{tanpq}{pqx}$$

$$= pq \cdot 1 = pq$$

The answer is D

20. $\lim_{x \to \infty} \frac{x^{12} + x^3 + x^1}{x^{120} - x^2 + 1}$Is?

a) x^6

b) 1

c) 0~

d) ∞

e) -1

Solution

$$\lim_{x \to \infty} \frac{x^{12} + x^3 + x^1}{x^{120} - x^2 + 1}$$

$$= \lim_{x \to \infty} \frac{\frac{x^{12}}{x^{120}} + \frac{x^3}{x^{120}} + \frac{x^1}{x^{120}}}{\frac{x^{120}}{x^{120}} - \frac{x^2}{x^{120}} + \frac{1}{x^{120}}}$$

$$= \lim_{x \to \infty} \frac{\frac{1}{x^{108}} + \frac{1}{x^{117}} + \frac{1}{x^{119}}}{1 - \frac{1}{x^{118}} + \frac{1}{x^{120}}}$$

$$= \frac{0 + 0 + 0}{1 + 0 + 0} = \frac{0}{1} = 0$$

The answer is C

21. $\lim_{x \to \infty} \frac{x^7 + 25 + x}{3x^2 + x^7 + 1}$ is?

a) 2

b) 1 ~

c) -1

d) 3

e) $\frac{2}{3}$

Solution

$$\lim_{x\to\infty} \frac{x^7 + 25 + x}{3x^2 + x^7 + 1}$$

$$= \lim_{x\to\infty} \frac{\frac{x^7}{x^7} + \frac{25}{x^7} + \frac{x}{x^7}}{\frac{3x^2}{x^7} + \frac{x^7}{x^7} + \frac{1}{x^7}}$$

$$= \lim_{x\to\infty} \frac{1 + \frac{25}{x^7} + \frac{1}{x^6}}{\frac{3}{x^5} + 1 + \frac{1}{x^7}}$$

$$= \frac{1 + 0 + 0}{0 + 1 + 0} = \frac{1}{1} = 1$$

The answer is B

22. The value of $\lim_{x \to \infty} \frac{x^4 + x^3 + x^1}{x^6 - x^2 + 1}$ is

a) x^6

b) 1

c) ∞

d) 0 ~

e) 2

Solution

$$\lim_{x \to \infty} \frac{x^4 + x^3 + x^1}{x^6 - x^2 + 1}$$

$$= \lim_{x \to \infty} \frac{\frac{x^4}{x^6} + \frac{x^3}{x^6} + \frac{x^1}{x^6}}{\frac{x^6}{x^6} - \frac{x^2}{x^6} + \frac{1}{x^6}}$$

$$= \lim_{x \to \infty} \frac{\frac{1}{x^4} + \frac{1}{x^3} + \frac{1}{x^5}}{1 - \frac{1}{x^4} + \frac{1}{x^6}}$$

$$= \frac{0+0+0}{1-\ 0+0} = \frac{0}{1} = 0$$

The answer is D

23. The value of $\lim_{x \to \infty} \frac{x^2 + 6x^5 + 2x - 22}{3x^5 - x^2 + 1}$ is

a) x^4

b) 1

c) ∞

d) 0

e) 2~

Solution

$$\lim_{x \to \infty} \frac{x^2 + 6x^5 + 2x - 22}{3x^5 - x^2 + 1}$$

$$= \lim_{x \to \infty} \frac{\frac{x^2}{x^5} + \frac{6x^5}{x^5} + \frac{2x}{x^5} - \frac{22}{x^5}}{\frac{3x^5}{x^5} - \frac{x^2}{x^5} + \frac{1}{x^5}}$$

$$= \lim_{x \to \infty} \frac{\frac{1}{x^3} + 6 + \frac{2}{x^4} - \frac{22}{x^5}}{3 - \frac{1}{x^3} + \frac{1}{x^5}}$$

$$= \frac{0+6+0-0}{3-0+0}$$

$$= \frac{6}{3} = 2$$

The answer is E

24. The value of $\lim_{x \to \infty} \frac{3x^3 + x^2 + 2\,x + 1}{x^4 - x^2 - x + 13}$ is

a) x^4

b) 3

c) ∞

d) 0~

e) $\frac{3}{4}$

Solution

$$= \lim_{x \to \infty} \frac{3x^3 + x^2 + 2x + 1}{x^4 - x^2 - x + 13}$$

$$= \lim_{x \to \infty} \frac{\frac{3x^3}{x^4} + \frac{x^2}{x^4} + \frac{2x}{x^4} + \frac{1}{x^4}}{\frac{x^4}{x^4} - \frac{x^2}{x^4} - \frac{x}{x^4} + \frac{13}{x^4}}$$

$$= \lim_{x \to \infty} \frac{\frac{3}{x} + \frac{1}{x^2} + \frac{2}{x^3} + \frac{1}{x^4}}{1 - \frac{1}{x^2} - \frac{1}{x^3} + \frac{13}{x^4}}$$

$$= \frac{0 + 0 + 0 + 0}{1 - 0 - 0 + 0} = \frac{0}{1} = 0$$

The answer is D

25. The value of $\lim_{x \to \infty} \frac{2x^5 + 3x^4 + 5x^6}{4x^5 - 2x^2 + 21}$ is

a) x^{11}

b) $\frac{2}{5}$

c) ∞~

d) 0

e) 5

Solution

$$\lim_{x \to \infty} \frac{2x^5 + 3x^4 + 5x^6}{4x^5 - 2x^2 + 21}$$

$$= \lim_{x \to \infty} \frac{\frac{2x^5}{x^6} + \frac{3x^4}{x^6} + \frac{5\,x^6}{x^6}}{\frac{4x^5}{x^6} - \frac{2x^2}{x^6} + \frac{21}{x^6}}$$

$$= \lim_{x \to \infty} \frac{\frac{2}{x} + \frac{3}{x^2} + 5}{\frac{4}{x} - \frac{2}{x^4} + \frac{21}{x^6}}$$

$$= \frac{0 \pm 0 + 5}{0 - 0 + 0} = \frac{5}{0} = \infty$$

The answer is C

26. The value of $\lim_{x\to\infty} \frac{4x^4 + x^2 + 3}{-3x^2 - 6x^4 + 1}$ is?

a) 2

b) $\frac{1}{3}$

c) $\frac{2}{-3}$ ~

d) 0

Solution

$$\lim_{x\to\infty} \frac{4x^4 + x^2 + 3}{-3x^2 - 6x^4 + 1}$$

$$= \lim_{x\to\infty} \frac{\frac{4x^4}{x^4} + \frac{x^2}{x^4} + \frac{3}{x^4}}{\frac{-3x^2}{x^4} - \frac{6x^4}{x^4} + \frac{1}{x^4}}$$

$$= \lim_{x\to\infty} \frac{4 + \frac{1}{x^2} + \frac{3}{x^4}}{\frac{-3}{x^2} - 6 + \frac{1}{x^4}}$$

$$= \frac{4 + 0 + 0}{0 - 6 + 0} = \frac{4}{-6} = \frac{2}{-3}$$

The answer is C

27. $\lim_{x\to 0} \frac{\tan 2x}{x}$

a) 0

b) 1

c) undefined

d) ∞

e) 2~

Solution

$$\lim_{x\to 0} \frac{\tan 2x}{x}$$

$$= \lim_{x\to 0} \frac{\tan 2x}{x} \cdot \frac{2}{2}$$

$$= \lim_{x\to 0} \frac{2\tan 2x}{2x}$$

$$= 2\lim_{x\to 0} \frac{\tan 2x}{x}$$

$$= 2 \cdot 1 = 2$$

The answer is E

28. $\lim_{x\to 0} \frac{e^{3x^2}-1}{x^2}$ is _______

a) 0

b) -2

c) 3 ~

d) ∞

Solution

$$\lim_{x\to 0} \frac{e^{3x^2}-1}{x^2}$$

$$e^{3x^2} = 1 + 3x^2 + \frac{9x^4}{2!} + \frac{27x^6}{3!} + \cdots$$

$$\Rightarrow \lim_{x\to 0}\frac{1+3x^2+\frac{9x^4}{2!}+\frac{27x^6}{3!}+\cdots-1}{x^2}$$

$$=\lim_{x\to 0}\frac{3x^2}{x^2}+\frac{9x^4}{2x^2}+\frac{27x^6}{6x^2}+\cdots$$

$$=\lim_{x\to 0}3+\frac{9x^2}{2}+\frac{27x^4}{6}+\cdots$$

$$=3\ \lim_{x\to 0}\frac{9x^2}{2}+\frac{27x^4}{6}+\cdots=3$$

The answer is C

29. $\lim_{h\to 0}\frac{\mathrm{Sin}(5h)-1}{1-\mathrm{Sin}(h)}$

a) 1

b) -9

c) -5 ~

d) ∞

e) 10

Solution

To solve this $\lim_{h\to 0}\frac{\mathrm{Sin}(5h)-1}{1-\mathrm{Sin}(h)}$ we apply the L' Hospital rule

$$\lim_{h\to 0}\frac{\mathrm{Sin}(5h)-1}{1-\mathrm{Sin}(h)}$$

$$=\lim_{x\to 0}\frac{\frac{\mathrm{d(sin\ (5h))}}{\mathrm{dh}}-\frac{d(1)}{dh}}{\frac{d(1)}{dh}-\frac{\mathrm{d(sin\ (5h))}}{\mathrm{dh}}}$$

$$=\lim_{x\to 0}\frac{5\cos(5h)}{-(\cos h)}$$

$$=-\frac{5\cos(5\cdot 0)}{\cos 0}=-\frac{5\cdot 1}{1}=-5$$

The answer is C

30. $\lim_{x\to 0}\frac{\cosh(3h)-1}{1-\cosh(h)}$

a) 9

b) -3

c) -9 ~

d) ∞

e) None

Solution

To solve this $\lim_{x \to 0} \frac{\cos(3h)-1}{1-\cos\ (h)}$we apply the L' Hospital rule

$$\lim_{x\to 0}\frac{\cos(3h)-1}{1-\cosh(h)}$$

$$=\lim_{x\to 0}\frac{\frac{\mathrm{d}(\cos\,(3\mathrm{h}))}{\mathrm{dh}}-\frac{d(1)}{dh}}{\frac{d(1)}{dh}-\frac{\mathrm{d}(\cos\,(3\mathrm{h}))}{\mathrm{dh}}}$$

$$=\lim_{x\to 0}\frac{-3\sin\,(3h)}{-(-\sin h)}$$

$$=\lim_{x\to 0}-\frac{\frac{d(3\sin(3h))}{dh}}{\frac{d(\sin h)}{dh}}$$

$$=\lim_{x\to 0}-\frac{9\cos(3h)}{\cos h}$$

$$=-\frac{9\cos(3\cdot 0)}{\cos 0}=-\frac{9\cdot 1}{1}=-9$$

The answer is C

31. If $f(x) = 3x^2 - 1$ and$g(x) = 3x$. Then, $f\big(g(2)\big)$ is given by

a) $3\sin^2(5x) - 1$

b) 107~

c) 33

d) 105

e) 32

Solution

$f(x) = 3x^2 - 1$ and $g(x) = 3x$

Now $g(2) = 3(2) = 6$

$$\Rightarrow f\big(g(2)\big) = f(6) = 3(6)^2 - 1 = 108 - 1 = 107$$

$$\Rightarrow f\big(g(2)\big) = 107$$

The answer is B

32. If $f(x) = 3x^2 - 2x + 1$, then, $f(-1)$is?

a) 6~

b) -1

c) 2

d) 0

Solution

$$f(x) = 3x^2 - 2x + 1$$

$$\Rightarrow f(-1) = 3(-1)^2 - 2(-1) + 1 = 6$$

$$\Rightarrow f(-1) = 6$$

The answer is A

33. If $f(x) = 3x^2 - 1$ and $g(x) = \sin(5x)$. Then, $f\big(g(\pi)\big)$ is given by

a) $3\sin^2(5x) - 1$

b) 1

c) -1 ~

d) 0

e) 5

Solution

$f(x) = 3x^2 - 1$ and $g(x) = \sin(5x)$

Now $g(\pi) = \sin(5\pi) = 0$

$$\Rightarrow f\big(g(\pi)\big) = f(0) = 3(0)^2 - 1 = -1$$

$$\Rightarrow f\big(g(\pi)\big) = -1$$

The answer is C

34. A function $f(x)$ is said to be oddfunction if

a) $f(x) = -f(x)$

b) $f(-x) = -f(x)$~

c) $f(-x) = f(x)$

d) $f(x^2) = -f(x)$

e) None

Solution

$f(x)$ Is said to be odd function if $\boldsymbol{f(-x) = -f(x)}$

The answer is B

35. A function $f(x)$ is said to be even function if

a) $f(x) = -f(x)$

b) $f(-x) = -f(x)$

c) $f(-x) = f(x)$ ~

d) $f(x^2) = -f(x)$

e) None

Solution

$f(x)$ Is said to be even function if $\boldsymbol{f(-x) = f(x)}$

The answer is C

36. $f(x)$Is even if it is?

a) Symmetrical about y - axis

b) Periodic

c) Symmetrical about x-axis

d) Constant

e) Linear

Solution

$f(x)$ Is even if it is symmetrical about y-axis**,** since $\boldsymbol{f(-x) = f(x)}$

The answer is C

37. Which of the following is true about $f(x) = \sin x + \cos x$

a) it is even

b) $xf(x)$ is even

c) it is odd

d) $xf(x)$ is odd

e) it is neither even nor odd~

Solution

$$f(x) = \sin x + \cos x$$

$$f(-x) = \sin(-x) + \cos(-x)$$

$$f(-x) = -\sin x + \cos x$$

$$f(-x) = -(\sin x - \cos x)$$

$$f(-x) \neq -f(x) \neq f(x)$$

$\Rightarrow f(x)$Is neither even nor odd.

The answer is E

38. If $f(x) = -\sin x - x^3$, then which of the following is not true about $f(x)$

a) $f(x)$is even

b) $f(x)$ is odd ~

c) $f(x) - x^2$ is odd

d) $f(x) + \sin x$ is even

e) $f(x)$ is neither even nor odd

Solution

$$f(x) = -\sin x - x^3$$

$$f(-x) = -(-\sin x) - (-x^3)$$

$$f(-x) = \sin x + x^3$$

$$f(-x) = -(\sin x - x^3)$$

$$f(-x) = -f(x)$$

$f(x)$Is odd

The answer is B

39. If $f(x) = \frac{x^2}{\cos x} + 2x^4$ which of the following is true about $f(x)$

a) $f(x)$is periodic

b) $f(x)$ is odd

c) $f(x)$ is even ~

d) $f(x)$ is not defined at 0

e) $f(x)$ is linear

Solution

$f(x)$ Is even because the sum of two or more even number is an even function

The answer is C

40. If $f(x) = \begin{cases} \frac{\sqrt{1+x^2}-\sqrt{2}}{x-1} & if \quad x \neq 1 \\ k & if \quad x = 1 \end{cases}$ for what value of k is $f(x)$

contimnuous

a) $\sqrt{2}$

b) 2

c) $\frac{\sqrt{2}}{2}$ ~

d) ∞

e) 0

Solution

$$k = \frac{\sqrt{1+x^2}-\sqrt{2}}{x-1}$$

$$k = \frac{\sqrt{1+x^2}-\sqrt{2}}{x-1} \cdot \frac{\sqrt{1+x^2}+\sqrt{2}}{\sqrt{1+x^2}+\sqrt{2}}$$

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

$$k = \frac{1+x^2-2}{x-1(\sqrt{1+x^2}+\sqrt{2})} = \frac{x^2-1}{x-1(\sqrt{1+x^2}+\sqrt{2})}$$

$$k = \frac{(x-1)(x+1)}{x-1(\sqrt{1+x^2}+\sqrt{2})}$$

$$k = \frac{(x+1)}{(\sqrt{1+x^2}+\sqrt{2})}$$

If $x = 1$

$$\Rightarrow k = \frac{(1+1)}{(\sqrt{1+1^2}+\sqrt{2})} = \frac{2}{2\sqrt{2}}$$

$$k = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

The answer is C

41. Consider the function $k(t) = \cos t$, then

a) $k(t)$ is odd

b) $t^2 k(t)$ is even ~

c) $t^3 k(t)$ is odd

d) $tk(t)$ is even

Solution

$$k(t) = \cos t$$

$$k(-t) = \cos(-t)$$

$$k(-t) = \cos t$$

$$k(t) = k(t)$$

$$k(t)\ is\ even$$

And also $t^2 k(t)$ is even

$$k(-t) = (-t)^2 \cos(-t)$$

$$k(-t) = t^2 \cos t$$

$$\Rightarrow k(-t) = t^2 k(t)$$

$\Rightarrow t^2 k(t)$ is even

The answer is B

42. The domain of the function $\frac{x^2-1}{x-2}$ is

a) $\{x \in \mathbb{R}: x \neq 0\}$

b) $\{x \in \mathbb{R}: x \neq 1\}$

c) $\{x \in \mathbb{R}: x \neq 2\}$ ~

d) $\{x \in \mathbb{R}: 0 \leq x \leq 1\}$

Solution

The function $f(x) = \frac{x^2-1}{x-2}$ can take all values in the real line except for $x = 2$. Since substituting $x = 2$ in the function will result the denominator of the function to be undefined. Hence the domain of the function $f(x) = \frac{x^2-1}{x-2}$ is

$\{x \in \mathbb{R}: x \neq 2\}$.

The answer is C

43. $g: R \to R, given\ by\ g(x) = \frac{2}{x\sqrt{4-x^2}}$ Is defined for all $x \in R$ except?

a) {0, 1}

b) {-2, 0, 2}

c) {-1, 0, 1}

d) {0, 1}

Solution

$g(x) = \frac{2}{x\sqrt{4-x^2}}$Is defined for all $x \in R$except for {-2, 0, 2}. Since substituting the three values will make $g(x)$to be undefined

The answer is B

44. The domain of the real function of real variables defined by $k(x) = \frac{2x}{x^2-1}$is?

a) $\mathbb{R}$

b) $\mathbb{R}\backslash\{1,2\}$

c) $\mathbb{R}\backslash\{1\}$

d) $\mathbb{R}\backslash\{-1,1\}$ ~

e) $\mathbb{R}\backslash\{0,1\}$

Solution

The domain of the function $k(x) = \frac{2x}{x^2-1}$ is the set of real numbers excluding 1 and -1.

Since substituting 1 or -1 will make the function undefined. Then the domain is$\mathbb{R}\backslash\{-1,1\}$.

The answer is D

45. $f: A \to B$ is a functions if

a) It can maps each elements of A to more than one elements of B

b) It is a relation

c) It maps a proper subset of A to B

d) It maps each elements of A to a unique elements of B ~

Solution

$f: A \to B$Is a functions if it maps each elements of A to a unique elements of B

The answer is D

46. If $F(x) = x^2 + 3\ and\ G(x) = x + 1, H(x) = -x^2 + 4$ then $G(F(x) + H(x))$ is

a) 0

b) 24

c) 8 ~

d) 7

Solution

$$F(x) = x^2 + 3\ and\ G(x) = x + 1, H(x) = -x^2 + 4$$

$F(x) + H(x) = x^2 + 3 + (-x^2 + 4)$

$$F(x) + H(x) = 7$$

Now

$$G\big(F(x) + H(x)\big) = G(7) = 7 + 1 = 8$$

$$G\big(F(x)+H(x)\big)=8$$

The answer is C

47. Find derivative of $y=e^{cosx}$

a) $sinxe^{\cos x}$

b) $-sinx\ \ ^{cosx}$ ~

c) $e^{\sin x}$

d) e^{cosx}

e) $sinx\ \ ^{cosx}$

Solution

$$y=e^{cosx}$$

Let $u=\cos x$

$$\frac{du}{dx}=-\sin x$$

$$y=e^{u}$$

$$\frac{dy}{du}=e^{u}$$

$$\frac{dy}{dx}=\frac{du}{dx}\cdot\frac{dy}{du}$$

$$\frac{dy}{dx}=-\sin xe^{u}$$

$$\frac{dy}{dx}=-\sin xe^{cosx}$$

The answer is B

48. Find derivative of $y=e^{5x-2}$

a) $5xe^{5x-2}$

b) $5e^{5x-2}$~

c) $(5x-2)e^{5x-2}$

d) e^{5x-2}

e) $5e^5$

Solution

$$y = e^{5x-2}$$

Let $u = 5x - 2$

$$\Rightarrow \frac{du}{dx} = 5$$

$$y = e^u$$

$$\Rightarrow \frac{dy}{du} = e^u$$

$$\frac{dy}{dx} = \frac{du}{dx} \cdot \frac{dy}{du}$$

$$\frac{dy}{dx} = 5e^u$$

But $u = 5x - 2$

$$\frac{dy}{dx} = 5e^{5x-2}$$

The answer is B

49. If $y = x^x$ then $\frac{dy}{dx}$ is?

a) $x^x(1 + \ln x)\, e^x$

b) $x^x \ln x$

c) 0

d) $x^x(1 + \ln x)$ ~

e) $None$

Solution

$$y = x^x$$

Multiply both side by (ln)

$$\ln y = \ln x^x$$

$$\ln y = \mathrm{x} \ln x$$

Now differentiating both side

$$\frac{1}{y}\frac{dy}{dx} = x \cdot \frac{1}{x} + \ln x$$

$$\frac{1}{y}\frac{dy}{dx} = 1 + \ln x$$

$$\frac{dy}{dx} = y(1 + \ln x)$$

But $y = x^x$

$$\frac{dy}{dx} = x^x(1 + \ln x)$$

The answer is D

50. If $y = \log{(2x - 1)}$ then $\frac{dy}{dx}$ is?

a) $\frac{2}{2x-1}$~

b) $2\ln{(2x - 1)}$

c) $\frac{1}{2x-1}$

d) $\frac{1}{2(2x-1)}$

e) 2

Solution

$$y = \log{(2x - 1)}$$

Let $u = 2x - 1$

$$\frac{du}{dx} = 2$$

$$y = \log u$$

$$\frac{dy}{du} = \frac{1}{u}$$

$$\frac{dy}{dx} = \frac{du}{dx} \cdot \frac{dy}{du}$$

$$\frac{dy}{dx} = 2 \cdot \frac{1}{u}$$

But $u = 2x - 1$

$$\frac{dy}{dx} = \frac{2}{2x - 1}$$

The answer is A

51. Find $\frac{dy}{dx}$ if $y = a^{\sin x}$

a) $a^{\sin x}$

b) $a^{\sin x} \ln a$

c) $a^{\sin x} \cos x \ln a$ $\sim$

d) $\frac{a^{\sin x}}{\ln a}$

Solution

$$y = a^{\sin}$$

Multiply both side by (ln)

$$\ln y = \ln a^{\sin x}$$

$$\ln y = \sin x \ \ln a$$

Now differentiating both side

$$\frac{1}{y}\frac{dy}{dx} = \cos x \ln a$$

$$\frac{dy}{dx} = y(\cos x \ln a)$$

But $y = a^{\sin}$

$$\frac{dy}{dx} = a^{\sin x}(\cos x \ln a)$$

The answer is C

52. Find $\frac{dy}{dx}$ if $y = 3^{\sin}$

a) $3^{\sin x}$

b) $3^{\sin x}\ln 3$

c) $3^{\sin x}\cos x\ln 3$ ~

d) $\frac{3^{\sin x}}{\ln 3}$

Solution

$$y = 3^{\sin x}$$

Multiply both side by (ln)

$$\ln y = \ln 3^{\sin x}$$

$$\ln y = \sin x\ \ln 3$$

Now differentiating both side

$$\frac{1}{y}\frac{dy}{dx} = \cos x\ln 3$$

$$\frac{dy}{dx} = y(\cos x\ln 3)$$

But $y = 3^{\sin x}$

$$\frac{dy}{dx} = 3^{\sin x}(\cos x\ln 3)$$

The answer is C

53. Find $\frac{dy}{dx}$ if $y = 5^x$

a) 5^x

b) $5^x\ln 2$

c) $5^x\ln 5$ ~

d) $\frac{5^x}{\ln 5}$

Solution

$$y = 5^x$$

Multiply both side by (ln)

$$\ln y = \ln 5^x$$

$$\ln y = \text{x} \ln 5$$

Now differentiating both side

$$\frac{1}{y}\frac{dy}{dx} = \ln 5$$

$$\frac{dy}{dx} = y(\ln 5)$$

But $y = 5^x$

$\frac{dy}{dx} = 5^x \ln 5$

The answer is C

54. $\frac{dy}{dx}$ of the function $y = cosxsecx$

a) 1

b) 0~

c) x

d) $cotx$

Solution

$$y = cosxsecx$$

Let $u = cosx$

$$\Rightarrow \frac{du}{dx} = -\sin x$$

$$v = secx$$

$$\Rightarrow \frac{dv}{dx} = secx \tan x$$

$$\frac{dy}{dx} = \frac{udv}{dx} + \frac{vdu}{dx}$$

$$\frac{dy}{dx} = cosx \cdot secx \tan x + secx(-\sin x)$$

$$\frac{dy}{dx} = cosx \cdot secx \frac{\sin x}{\cos x} + secx(-\sin x)$$

$$\frac{dy}{dx} = secx \sin x - secx \sin x$$

$$\frac{dy}{dx} = 0$$

The answer is B

55. If $3xy - x^2 = 6$ find $\left.\frac{dy}{dx}\right|_{(1,0)}$

a) $-\frac{1}{2}$

b) $\frac{2}{3}$ ~

c) $\frac{1}{2}$

d) ∞

e) None

Solution

$$3xy - x^2 = 6$$

$$3x\frac{dy}{dx} + 3y - 2x = 0$$

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

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

$$at\ x = 1\ and\ y = 0$$

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

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

The answer is B

56. If $3xy + \tan(xy) - x^2 = 6$ find $\left.\frac{dy}{dx}\right|_{(1,0)}$

a) $-\frac{1}{2}$

b) $-\frac{2}{3}$

c) $\frac{1}{2}$ ~

d) ∞

e) None

Solution

The answer is

57. If $y = 5t\sin 2t$ then, $\frac{dy}{dt}$ is

a) $10t\cos st + 1$

b) $10(t\cos 2t + \sin 2t)$

c) 0

d) $\cos 2t + \sin 2t$

e) $5(2t\cos 2t + \sin 2t)$~

Solution

$$y = 5t\sin 2t$$

Let $u = 5t$

$$\frac{du}{dx} = 5$$

$$v = \sin 2t$$

$$\frac{dv}{dx} = 2\cos 2t$$

$$\frac{dy}{dx} = \frac{udv}{dx} + \frac{vdu}{dx}$$

$$\frac{dy}{dx} = 5t \cdot 2\cos 2t + 5\sin 2t$$

$$\frac{dy}{dx} = 10t\cos 2t + 5\sin 2t$$

$$\frac{dy}{dx} = 5(2t\cos 2t + \sin 2t)$$

The answer is E

58. Let $y = \cos\theta$ and $x = \sin\theta$then dy/dx is

a) $\cot\theta$

b) $-\cot\theta$

c) $\tan\theta$

d) $-\tan\theta$~

e) $\sec\theta$

Solution

$y = \cos\theta$ and $x = \sin\theta$

$\frac{dy}{d\theta} = -\sin\theta$ and$\frac{dx}{dt} = \cos\theta$

$$\frac{dy}{dx} = \frac{dy}{d\theta} \cdot \frac{d\theta}{dx}$$

$$\frac{dy}{dx} = -\sin\theta \cdot \frac{1}{\cos\theta}$$

$$\frac{dy}{dx} = -\tan\theta$$

The answer is D

59. If $y = x\ln x$ then $\frac{dy}{dx} - 1$ is?

a) $2 + \ln x$

b) 0

c) $x + \ln x$

d) 1

e) $\ln x$~

Solution

$$y = x \ln x$$

$$\frac{dy}{dx} = x \cdot \frac{1}{x} + \ln x$$

$$\frac{dy}{dx} = 1 + \ln x$$

$$\frac{dy}{dx} - 1 = (1 + \ln x) - 1$$

$$\frac{dy}{dx} - 1 = \ln x$$

The answer is E

60. Let $z = t^2 + 1$ and $k = \sin 2t$ then $\frac{dz}{dk}$ is?

a) $\frac{2t}{\cos}$

b) $2t \cos t$

c) $\frac{t}{\cos 2t}$ ~

d) $t \cos 2t$

e) $None$

Solution

$z = t^2 + 1$ and $k = \sin 2t$

$\frac{dz}{dt} = 2t$ and $\frac{dk}{dt} = 2\cos 2t$

$$\frac{dz}{dk} = \frac{dz}{dt} \cdot \frac{dt}{dk}$$

$$\frac{dz}{dk} = 2t \cdot \frac{1}{2\cos 2t}$$

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

The answer is C

61. If $y = \tan^{-1}(e^x)$ then, $\frac{dy}{dx}$ is?

a) $\frac{e^x}{1+e^{2x}}$ ~

b) 0

c) $\frac{e^x}{1+x^2}$

d) $\tan^{-1} x$

Solution

$$y = \tan^{-1}(e^x)$$

Let $u = e^x$

$$\frac{du}{dx} = e^x$$

$$y = \tan^{-1}(u)$$

$$\frac{dy}{du} = \frac{1}{1+u^2}$$

$$\frac{dy}{dx} = \frac{du}{dx} \cdot \frac{dy}{du}$$

$$\frac{dy}{dx} = e^x \cdot \frac{1}{1+u^2}$$

But $u = e^x$

$$\frac{dy}{dx} = \frac{e^x}{1+e^{2x}}$$

The answer is A

62. If $y = \tan^{-1} 2x$ then, $\frac{dy}{dx}$ is

a) $\frac{2}{1+2x}$

b) 0

c) $\frac{2}{1+4x^2}$ ~

d) $\tan^{-1}2\,x$

e) $\frac{1}{1+x^2}$

Solution

$$y = \tan^{-1} 2x$$

Let $u = 2x$

$$\frac{du}{dx} = 2$$

$$y = \tan^{-1}(u)$$

$$\frac{dy}{du} = \frac{1}{1+u^2}$$

$$\frac{dy}{dx} = \frac{du}{dx} \cdot \frac{dy}{du}$$

$$\frac{dy}{dx} = 2 \cdot \frac{1}{1+u^2}$$

But $u = 2x$

$$\frac{dy}{dx} = \frac{2}{1+4x^2}$$

The answer is C

63. If $y = \ e^{4x+1}$, then $\frac{dy}{dx}$ is

a) $e^{4x+1} \cdot \frac{1}{4}$

b) $4e^{4x+1}$ ~

c) $(4x + 1)e^{4x+1}$

d) e^{4x+1}

e) 4

Solution

$$y = e^{4x+1}$$

Let $u = 4x + 1$

$$\frac{du}{dx} = 4$$

$$y = e^u$$

$$\frac{dy}{du} = e^u$$

$$\frac{dy}{dx} = \frac{du}{dx} \cdot \frac{dy}{du}$$

$$\frac{dy}{dx} = 4 \cdot e^u$$

But $u = 4x + 1$

$$\frac{dy}{dx} = 4e^{4x+1}$$

The answer is B

64. If $y = \sin x^n$, $then\ \frac{dy}{dx}\ is;$

a) $-nx^{n-1} \sin x^n$

b) $nx^{n-1} \sin x^{n-1}$

c) $nx^{n-1} \cos x^n$ ~

d) $-nx^{n-1} \cos x^n$

Solution

$$y = \sin x^n$$

Let $u = x^n$

$$\frac{du}{dx} = nx^{n-1}$$

$$y = \sin u$$

$$\frac{dy}{du} = \cos u$$

$$\frac{dy}{dx} = \frac{du}{dx} \cdot \frac{dy}{du}$$

$$\frac{dy}{dx} = nx^{n-1} \cdot \cos u$$

But $u = x^n$

$$\frac{dy}{dx} = nx^{n-1} \cos x^n$$

The answer is C

65. For what positive value of θ is the $\frac{d}{dx}(\theta^2 x) = 9$

a) 3 ~

b) 6

c) 5

d) 9

e) 25

Solution

$$\frac{d}{dx}(\theta^2 x) = 9$$

$$\theta^2 x = 9$$

$$\theta = \sqrt{9}$$

$$\theta = 3$$

The answer is A

66. For what value of θ is the $\frac{d}{dx}(\theta^2 x^2) = 25x$

a) 4

b) 6

c) 5 ~

d) 1

e) 25

Solution

$$\frac{d}{dx}(\theta^2 x^2) = 25x$$

$$\theta^2 x = 25$$

$$\theta = \sqrt{25}$$

$$\theta = 5$$

The answer is C

67. $\frac{dy}{dx}$ of the function $y = \sqrt{3-2x}$ is

a) $\frac{1}{2\sqrt{3-2x}}$

b) $-\frac{1}{\sqrt{3-2x}}$ ~

c) $-\frac{(3-2x)^{\frac{3}{2}}}{3}$

d) $\frac{1}{2}(3-2x)$

Solution

$$y = \sqrt{3-2x}$$

$$y = (3-2x)^{\frac{1}{2}}$$

Let $u = 3 - 2x$

$$\frac{du}{dx} = -2$$

$$y = u^{\frac{1}{2}}$$

$$\frac{dy}{du} = \frac{1}{2}u^{-\frac{1}{2}}$$

$$\frac{dy}{dx} = \frac{du}{dx} \cdot \frac{dy}{du}$$

$$\frac{dy}{dx} = -2 \cdot \frac{1}{2\sqrt{u}}$$

But $u = 3 - 2x$

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

$$\frac{dy}{dx} = \frac{-1}{\sqrt{3 - 2x}}$$

The answer is B

68. $\frac{dy}{dx}$ of the function $y = \frac{x^2+3}{x+3}$ is

a) $\frac{3x^2+9}{(x+3)^2}$

b) 1

c) $\frac{x^2+6x-3}{(x+3)^2}$ ~

d) $\frac{3x^2-9}{(x+3)^2}$

Solution

$$y = \frac{x^2 + 3}{x + 3}$$

Let $u = x^2 + 3$

$$\frac{du}{dx} = 2x$$

$$v = x + 3$$

$$\frac{dv}{dx} = 1$$

$$\frac{dy}{dx} = \frac{\frac{vdu}{dx} - \frac{udv}{dx}}{v^2}$$

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

$$\frac{dy}{dx} = \frac{2x^2 + 6x - x^2 - 3}{(x+3)^2}$$

$$\frac{dy}{dx} = \frac{x^2 + 6x - 3}{(x+3)^2}$$

The answer is C

69. $\frac{dy}{dx}$ of the function $if\ x^2 - 2xy + 3y^2 = 8$ is

a) $\frac{8+2y-2x}{6y-2x}$

b) $\frac{3y-x}{y-x}$

c) $\frac{2x-2y}{6y-2x}$

d) $\frac{y-x}{3y-x}$~

Solution

$$if\ x^2 - 2xy + 3y^2 = 8$$

$$2x - 2x\frac{dy}{dx} - 2y + 6y\frac{dy}{dx} = 0$$

$$-2x\frac{dy}{dx} + 6y\frac{dy}{dx} = -2x + 2y$$

$$(-2x + 6y)\frac{dy}{dx} = -2x + 2y$$

$$\frac{dy}{dx} = \frac{-2x + 2y}{-2x + 6y} = \frac{2(y-x)}{2(3y-x)}$$

$$\frac{dy}{dx} = \frac{y-x}{(3y-x)}$$

The answer is D

70. $\frac{dy}{dx}$ of the function $y^2 - 2xy = 16$ is

a) $\frac{x}{y-x}$

b) $\frac{y}{x-y}$

c) $\frac{y}{y-x}$ ~

d) $\frac{y}{2y-x}$

Solution

$$y^2 - 2xy = 16$$

$$2y\frac{dy}{dx} - 2x\frac{dy}{dx} - 2y = 0$$

$$(2y - 2x)\frac{dy}{dx} - 2y = 0$$

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

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

$$\frac{dy}{dx} = \frac{y}{(y - x)}$$

The answer is C

71. $\int sin(3x - 1)dx =$

a) $\frac{1}{3}\cos(3x - 1) + c$

b) $3\cos(3x - 1) + c$

c) $-\frac{1}{3}\cos(3x - 1) + c$ ~

d) $-3\cos(3x - 1) + c$

Solution

$$\int sin(3x - 1)dx$$

$$let\ u = 3x - 1\ \ du = xdx$$

$$dx = \frac{du}{3}$$

$$\int sin(3x-1)dx = \int sinu\frac{du}{3}$$

$$= \frac{1}{3}\int sinu$$

$$= -\frac{1}{3}\cos u + c$$

But $u = 3x - 1$

$$= -\frac{1}{3}\cos 3x - 1 + c$$

The answer is C

72. $\int \frac{x^2+2x}{x^3+3x^2}\ dx$ is

a) $\ln(x^3 + 3x^2)^{\frac{1}{3}} + c$~

b) $lin(x^3 + 6x) +$ c

c) $x^3 + 6x +$ c

d) $x^2 + 6x +$ c

Solution

$$\int \frac{x^2 + 2x}{x^3 + 3x^2}\ dx$$

$$let\ f(x) = x^3 + 3x^2$$

$$f'(x) = 3x^2 + 6x$$

Note $\int \frac{f'(x)}{f(x)}$=$\ln f(x) + c$

$$\frac{3}{3}\int \frac{x^2 + 2x}{x^3 + 3x^2}dx$$

$$\frac{1}{3}\int \frac{3x^2 + 6x}{x^3 + 3x^2}dx$$

$$\frac{1}{3}\ln(x^3 + 3x^2) + c$$

$$\ln(x^3 + 3x^2)^{\frac{1}{3}} + c$$

The answer is A

73. $\int_0^{\frac{\pi}{2}} 2\sin 2x \; dx$is?

a) 1

b) 2

c) -1~

d) 4

e) -4

Solution

$$\int_0^{\frac{\pi}{2}} 2\sin 2x \; dx$$

$$let\ u = 2x \quad du = 2dx$$

$$dx = \frac{du}{2}$$

$$\int 2sin2xdx = 2\int sinu\frac{du}{2}$$

$$= \frac{2}{2}\int sinu\ du$$

$$= -\cos u \Big|_0^{\frac{\pi}{2}}$$

$$But\ u = 2x$$

$$= -\cos 2x \Big|_0^{\frac{\pi}{2}}$$

$$= -\cos(2 \cdot \frac{\pi}{2}) - (-\cos(2 \cdot 0))$$

$$= -(-1) - (-1)$$

$$= 1 + 1 = 2$$

The answer is B

74. $\int x\, e^x\, dx$ is?

a) $e^x(1-x)+\ c$

b) $e^x(x-1)+\ c$ ~

c) $e^x(1-x)+\ x+c$

d) xe^x

Solution

$$\int xe^x\, dx$$

$$let\ u = x\ \ du = 1$$

$$dv = e^x\ \ v = e^x$$

$$\int udv = uv - \int vdu$$

$$xe^x - \int e^x\, dx$$

$$xe^x - e^x$$

$$e^x(x-1) = +c$$

The answer is B

75. $\int_0^{\frac{\pi}{2}} (\sin 2x +\ 2\cos x)\, dx$Is?

a) 0

b) 1

c) 2

d) 3 ~

Solution

$$\int_0^{\frac{\pi}{2}} (\sin 2x +\ 2\cos x)\, dx$$

$$\int_0^{\frac{\pi}{2}} \sin 2x\, dx + \int_0^{\frac{\pi}{2}} 2\cos x\, dx$$

$$= -\frac{1}{2}\cos 2x \Big|_0^{\frac{\pi}{2}} + 2\sin x \Big|_0^{\frac{\pi}{2}}$$

$$= \left[-\frac{1}{2}\cos 2x + 2\sin x\right]\Big|_0^{\frac{\pi}{2}}$$

$$= \left[-\frac{1}{2}\cos(2\cdot\frac{\pi}{2}) + 2\sin\frac{\pi}{2}\right] - \left[-\frac{1}{2}\cos 0 + 2\sin 0\right]$$

$$= \left[-\frac{1}{2}(-1) + 0\right] - \left[-\frac{1}{2}(1) + 0\right]$$

$$= \frac{1}{2} + \frac{1}{2} = 1$$

The answer is D

76. $\int \frac{1}{x^2 - 1}\; dx$ is?

a) $\frac{1}{2}\ln\frac{x+1}{x-1} + \; c$

b) $\ln\frac{x+1}{x-1} + \; c$

c) $\frac{1}{2}\ln\frac{x-1}{x+1} + \; c$ ~

d) $\ln\frac{x-1}{x+1} + \; c$

Solution

$$\int \frac{1}{x^2 - 1}\; dx = \int \frac{1}{(x-1)(x+1)}\; dx$$

Splitting $\frac{1}{(x-1)(x+1)}$ into partial fraction

$$\frac{1}{(x-1)(x+1)} = \frac{A}{(x-1)} + \frac{B}{(x+1)}$$

$$1 = A(x+1) + B(x-1)$$

$$put\ x = -1\ \Rightarrow B = -\frac{1}{2}$$

$$put\ x = 1 \Rightarrow A = \frac{1}{2}$$

$$\therefore \int \frac{1}{(x-1)(x+1)}\, dx = \int (\frac{1}{2(x-1)} - \frac{1}{2(x+1)})dx$$

$$= \frac{1}{2}\int \frac{1}{(x-1)} dx - \frac{1}{2}\int \frac{1}{(x-1)} dx$$

$$\frac{1}{2}\ln(x-1) - \frac{1}{2}\ln(x+1) + c$$

$$\frac{1}{2}[\ln(x-1) - \ln(x+1)] + c$$

$$\frac{1}{2}\ln\frac{x-1}{x+1} + c$$

The answer is C

77. $\int \frac{x^3+x}{x^2}\, dx$ is?

a) $\ln\frac{x}{x^2} + c$

b) $x + x^2 + c$

c) x $+ \ln x + c$

d) $\frac{x^2}{2} + \ln x + c$

Solution ~

$$\int \frac{x^3 + x}{x^2}\, dx = \int (\frac{x^3}{x^2} + \frac{x}{x^2})\, dx$$

$$\int (x + \frac{1}{x})dx$$

$$\frac{x^2}{2} + \ln c + c$$

The answer is D

78. $if\ y = 4e^{-2x}$then $\frac{dy}{dx} + \int 4e^{-2x} dx$ is

a) $4e^{2x}$

b) $-8e^{2x}$

c) $6e^{2x}$

d) $-10e^{-2x}$ ~

Solution

If $y = 4e^{-2x} \Rightarrow \frac{dy}{dx} = -8e^{-2x}$

And $\int 4e^{-2x}dx = -2e^{-2x}$

Now then $\frac{dy}{dx} + \int 4e^{-2x}dx = -8e^{-2x} + (-2e^{-2x})$

$$= -10e^{-2x}$$

The answer is D

79. $\int_0^1 \ln x \ dx$ is?

a) 0

b) 1

c) -1 ~

d) $ln\ x$

Solution

$$\int_0^1 \ln x \ dx$$

$$let\ u = \ln x\ and\ dv = 1$$

$$du = \frac{1}{x}\ and\ v = x$$

$$\int udv = uv - \int vdu$$

$$\int_0^1 \ln x \ dx = x \ln x \Big|_0^1 - \int_0^1 x \cdot \frac{1}{x} dx$$

$$= x \ln x \Big|_0^1 - \int_0^1 1\, dx$$

$$= x \ln x \Big|_0^1 - x \Big|_0^1$$

$$= [x \ln x - x] \Big|_0^1$$

$$= [1 \ln 1 - 1] - [0 \ln 0 - 0]$$

$$= [0 - 1] - 0$$

$$= -1$$

The answer is C

80. if the derivative of a function is $2e^{4x+1}$, what is the function

a) $2e^{4x+1}$

b) e^{4x+1}

c) $\frac{e^{4x+1}}{2}$ ~

d) $4e^{4x+1}$

Solution

Let the function be *y*.

If $\frac{dy}{dx} = 2e^{4x+1}$

Integrating we have

$$\int \frac{dy}{dx} = \int 2e^{4x+1}$$

$$y = 2 \int e^{4x+1}$$

$$let\ u = 4x + 1 \quad du = 4dx$$

$$dx = \frac{du}{4}$$

$$y = 2 \int e^u \frac{du}{4} = \frac{2}{4} \int e^u du$$

$$= \frac{1}{2} e^{u} + c$$

$$but\ u = 4x + 1$$

$$= \frac{1}{2} e^{4x+1} + c$$

The answer is C

81. The correct formulae for integration by part is

a) $\int udv = uv - \int vdu$ ~

b) $\int vdv = uv + \int vdu$

c) $\int udv = uv - \int udu$

d) $\int udv = uv + \int vdu$

Solution

The correct formulae for integration by part is

$$\int udv = uv - \int vdu$$

The answer is A

82. $\int_0^{\frac{\pi}{4}} cos2x\ dx$ is

a) 0

b) 1

c) $\frac{1}{4}$

d) $\frac{1}{2}$ ~

Solution

$$\int_0^{\frac{\pi}{4}} cos2x\ dx$$

$$let\ u = 2x\ \ du = 2dx$$

$$dx = \frac{du}{2}$$

$$\int_0^{\frac{\pi}{4}} cos2xdx = \int_0^{\frac{\pi}{4}} cosu\frac{du}{2}$$

$$= \frac{1}{2}\int_0^{\frac{\pi}{4}} cosu\ du$$

$$= \frac{1}{2} sinu \Big|_0^{\frac{\pi}{4}}$$

$$But\ u = 2x$$

$$= \frac{1}{2} sin2x \Big|_0^{\frac{\pi}{4}}$$

$$= \frac{1}{2} sin(2 \cdot \frac{\pi}{4}) - (\frac{1}{2}\sin(2 \cdot 0))$$

$$= -\frac{1}{2} sin(\frac{\pi}{2}) - [\frac{1}{2}\sin(0)]$$

$$= \frac{1}{2}(1) - 0$$

$$= \frac{1}{2}$$

The answer is D

83. $\int_0^{\frac{\pi}{2}} sin2x\ dx$ is

a) 0

b) 1~

c) $\frac{1}{4}$

d) $\frac{1}{2}$

Solution

$$\int_0^{\frac{\pi}{2}} \sin 2x\ dx$$

$$let\ u = 2x \quad du = 2dx$$

$$dx = \frac{du}{2}$$

$$\int_0^{\frac{\pi}{2}} \sin 2x \ dx = \int_0^{\frac{\pi}{2}} sinu \frac{du}{2}$$

$$= \frac{1}{2}\int_0^{\frac{\pi}{2}} sinu\ du$$

$$= -\frac{1}{2}\cos u \Big|_0^{\frac{\pi}{2}}$$

$$But\ u = 2x$$

$$= -\frac{1}{2}\cos 2x \Big|_0^{\frac{\pi}{2}}$$

$$= -\frac{1}{2}\cos(2 \cdot \frac{\pi}{2}) - (-\frac{1}{2}\cos(2 \cdot 0))$$

$$= -\frac{1}{2}\cos(\pi) - [-\frac{1}{2}\cos(0)]$$

$$= -\frac{1}{2}(-1) - (-\frac{1}{2}(1))$$

$$= \frac{1}{2} + \frac{1}{2} = 1$$

The answer is B

84. $\int_0^1 9(3x+1)^2\ dx$

a) 0

b) 63

c) 64~

d) $\frac{1}{9}$

Solution

$$\int_0^1 9(3x+1)^2\ dx$$

$$let\ u = 3x + 1\ \ du = 3dx$$

$$dx = \frac{du}{3}$$

$$when\ x = 1\ \Rightarrow u = 4\ and\ when\ x = 0\ \Rightarrow u = 1$$

$$\int_0^1 9(3x+1)^2\,dx = \int_1^4 9u^2\,\frac{du}{3}$$

$$= \int_1^4 3u^2\,du$$

$$= \frac{3u^3}{3}\Big|_1^4$$

$$= 4^3 - 1^3$$

$$= 63$$

The answer is B

85. $\int_0^{\frac{\pi}{2}} xcosx\,dx$

a) $\frac{\pi}{2}$

b) 1

c) $\frac{\pi}{2} - 1$~

d) $\frac{\pi}{2} + 2$

Solution

$$\int_0^{\frac{\pi}{2}} xcosx\,dx$$

$$let\ u = x\ and\ dv = cosx$$

$$du = 1\ \ and\ \ v = sinx$$

$$\int udv = uv - \int vdu$$

$$\int_0^{\frac{\pi}{2}} xcosx\,dx = xsinx\Big|_0^{\frac{\pi}{2}} - \int_0^{\frac{\pi}{2}} sinx\,dx$$

$$= xsinx \Big|_0^{\frac{\pi}{2}} + cosx \Big|_0^{\frac{\pi}{2}}$$

$$= \left[xsinx + cosx \ \right|_0^{\frac{\pi}{2}}$$

$$= \left[\frac{\pi}{2} sin\frac{\pi}{2} + cos\frac{\pi}{2}\right] - [0 + cos0]$$

$$= \left[\frac{\pi}{2}\right] - 1$$

$$= \frac{\pi}{2} - 1$$

The answer is C

86. $\int xe^x \ dx$ is?

a) $e^x(x-1) + c\sim$

b) $xe^x + c$

c) $xe^x + x + \ c$

d) $xe^x + 2xe^x + c$

Solution

$$\int xe^x \, dx$$

$$let\ u = x \ \ du = 1$$

$$dv = e^x \ \ v = e^x$$

$$\int udv = uv - \int vdu$$

$$xe^x - \int e^x \, dx$$

$$xe^x - e^x$$

$$e^x(x-1) = +c$$

The answer is A

87. $\int \frac{dx}{x^2-1}$is?

a) $\log\left(\frac{x-1}{x+1}\right) + c$

b) $\frac{1}{2}\log(x-1)(x+1) + c$

c) $\frac{1}{2}\log\left(\frac{x-1}{x+1}\right) + c$~

d) $\frac{x-1}{x+1}$ +c

Solution

$$\int \frac{dx}{x^2-1} = \int \frac{dx}{(x+1)(x-1)} = \int \left[\frac{A}{x+1} + \frac{B}{x-1}\right] dx$$

$$\frac{1}{(x+1)(x-1)} = \frac{A}{x+1} + \frac{B}{x-1}$$

$$1 = A(x-1) + B(x+1)$$

$$put\ x = 1\ \Rightarrow B = \frac{1}{2}$$

$$put\ x = -1\ \Rightarrow A = -\frac{1}{2}$$

$$\int \frac{dx}{(x+1)(x-1)} = \int \left[\frac{-1}{2(x+1)} + \frac{1}{2(x-1)}\right] dx$$

$$= -\frac{1}{2}\int \frac{1}{x+1} dx + \frac{1}{2}\int \frac{1}{x-1} dx$$

$$= -\frac{1}{2}\log(x+1) + \frac{1}{2}\log(x-1) + c$$

$$= \frac{1}{2}[\log(x+1) - \log(x-1)] + c$$

$$= \frac{1}{2}\log\left(\frac{x+1}{x+1}\right)$$

The answer is C

88. $\int_{-1}^{2}(1-t^2)dt$

a) $\frac{1}{2}$

b) 1

c) 0~

d) 2

Solution

$$\int_{-1}^{2}(1-t^2)dt$$

$$=\left[t-\frac{t^3}{3}\right]_{-1}^{2}$$

$$=\left[2-\frac{2^3}{3}\right]-\left[-1-\frac{(-1)}{3}\right]$$

$$=\left[2-\frac{8}{3}\right]-\left[-1+\frac{1}{3}\right]$$

$$=\frac{-2}{3}+\frac{2}{3}=0$$

The answer is C

89. $\int_{-3}^{3} dx$

a) $\frac{1}{2}$

b) 3

c) 6~

d) 0

Solution

$$\int_{-3}^{3} dx = x\Big|_{-3}^{3}$$

$$=3-(-3)$$

$$=3+3=6$$

The answer is C

90. $\int \frac{sin3x}{1-cos}\ dx$

a) $\frac{1}{3}\ln(1-cos3x)+c$~

b) $sec^2 3x+c$

c) $\log\left(\frac{1}{sin3x}\right)+c$

d) $\frac{1+sin3x}{3}+\ c$

Solution

$$\int \frac{sin3x}{1-cos3x}\ dx$$

Let $f(x)=1-cos3x$

$$f'(x)=3\ sin3x$$

Then $\int \frac{sin3x}{1-cos3x}\ dx=\frac{1}{3}\int \frac{3sin3}{1-cos}\ dx$

$$=\frac{1}{3}\ln(1-cos3x)+c$$

The answer is A

91. $\int \frac{dx}{1+7x}$

a) $\frac{1}{7}\log(1+7x)+c$~

b) $\log(1+7x)+c$

c) $\log\left(\frac{1+7x}{7}\right)+c$

d) $\frac{1}{7}\log(7x)+c$

Solution

Let $f(x)=1+7x$

$$f'(x)=7$$

Then $\int \frac{dx}{1+7x}=\frac{7}{7}\int \frac{dx}{1+7x}=\frac{1}{7}\int \frac{7}{1+7x}\ dx$

$$\frac{1}{7}\log(1+7x)+c$$

The answer is A

92. $\int x^{-2}(x^2)dx$

a) c

b) $x + c$~

c) $x^2 + c$

d) $\frac{x^5}{5} + c$

Solution

$$\int x^{-2}(x^2)dx$$

$$= \int \frac{x^2}{x^2} dx = \int dx$$

$$= x + c$$

The answer is B

93. If we use integration by parts on the integral $\int x^3 sinx\ dx$,then we should pick $u\ and\ dv$ to be:

a) $u = x^3\ and\ dv = dx$

b) $u = x^3 sinx\ and\ dv = dx$

c) $u = x^3\ and\ dv = cosx\ dx$

d) $u = x^3\ and\ dv = sinx\ dx$~

Solution

The choice of U depends on the following order **ILATE**

I = Inverse function

L = Logarithm function

A = Algebraic function

T = Trigonometry function

E = Exponential function

Now form the function$x^3 sinx$, x^3 is algebraic function and $sinx$ is trigonometry function.

So $u = x^3$ and $dv = sinx$.

The answer is D