MATHS

NCERT - NCERT MATHEMATICS(GUJRATI)

INTEGRALS

Examples

1. Write an anti derivative for each of the following functions using the method of inspection:

(i) cos2x (ii) $3x^2 + 4x^3$ (iii) $\dfrac{1}{x}, x \neq 0$

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2. Find the following integrals:

(i) $\int \dfrac{x^3 - 1}{x^2} dx$ (ii) $\int \left(x^{\frac{2}{3}} + 1 \right) dx$ (iii) $\int \left(x^{\frac{3}{2}} + 2e^x - \dfrac{1}{x} \right) dx$

3. Find the anti derivative F of f defined by f (x) = $4x^3 - 6$, where F (0)

= 3

4. Integrate the following functions w.r.t. x:

(i) sinmx (ii) $2x \sin\left(x^2 + 1\right)$ (iii) $\dfrac{\tan^4 \sqrt{x} \sec^2 \sqrt{x}}{\sqrt{x}}$ (iv) $\dfrac{\sin\left(\tan^{-1} x\right)}{1 + x^2}$

5. Find the following integrals:

(i) $\int \sin^3 x \cos^2 x \, dx$ (ii) $\int \dfrac{\sin x}{\sin(x + a)} \, dx$ (iii) $\int \dfrac{1}{1 + \tan x} \, dx$

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6. Find (i) $\int \cos^2 x \, dx$ (ii) $\int \sin 2x \cos 3x \, dx$ (iii) $\int \sin^3 x \, dx$

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7. Find the following integrals:

$\int \dfrac{dx}{x^2 - 16}$ (ii) $\int \dfrac{dx}{\sqrt{2x - x^2}}$

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8. Find the following integral :

$\int \dfrac{dx}{x^2 - 6x + 13}$

9. Find the following integral :

$$\int \frac{x+2}{2x^2+6x+5} dx$$

10. Find $\int \dfrac{dx}{(x+1)(x+2)}$

11. Find $\int \dfrac{x^2+1}{x^2-5x+6} dx$

12. Find $\int \dfrac{3x-2}{(x+1)^2(x+3)} dx$

13. Find $\int \dfrac{x^2}{(x^2+1)(x^2+4)} dx$

14. Find $\int \dfrac{(3\sin\phi - 2)\cos\phi}{5 - \cos^2\phi - 4\sin\phi} d\phi$

15. Find $\int \dfrac{x^2 + x + 1 dx}{(x+2)(x^2+1)}$

16. Find $\int x\cos x\, dx$

17. Find $\int \log x \, dx$

18. Find $\int x e^x \, dx$

19. Find $\int \dfrac{x \sin^{-1} x}{\sqrt{1 - x^2}} \, dx$

20. Find $\int e^x \sin x \, dx$

21. Find (i) $\int e^x \left(\tan^{-1} x + \dfrac{1}{1 + x^2} \right) dx$ (ii) $\int \dfrac{(x^2 + 1)e^x}{(x + 1)^2} dx$

22. Find $\int \sqrt{x^2 + 2x + 5} \, dx$

23. Find $\int \sqrt{3 - 2x - x^2} \, dx$

24. Find $\int_0^2 (x^2 + 1) \, dx$ as the limit of a sum.

25. Evaluate $\int_0^2 e^x dx$ as the limit of a sum.

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26. Evaluate the following integrals:

(i) $\int_2^3 x^2 dx$ (ii) $\int_4^9 \dfrac{\sqrt{x}}{\left(30 - x^{\frac{3}{2}}\right)^2} dx$

(iii) $\int_1^2 \dfrac{x dx}{(x+1)(x+2)}$ (iv) $\int_0^{\frac{\pi}{4}} \sin^3 2t \cos 2t \, dt$

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27. Evaluate $\int_{-1}^1 5x^4 \sqrt{x^5 + 1} dx$

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28. Evaluate $\int_0^1 \dfrac{\tan^{-1} x}{1 + x^2} dx$

29. Evaluate $\int_{-1}^{2} \left| x^3 - x \right| dx$

30. Evaluate $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sin^2 x dx$

31. Evaluate $\int_{0}^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx$

32. Evaluate $\int_{-1}^{1} \sin^5 x \cos^4 x dx$

33. Evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \frac{\sin^4 x}{\sin^4 x + \cos^4 x}dx$

34. Evaluate $\displaystyle\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1 + \sqrt{\tan x}}$

35. Evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \log \sin x \, dx$

36. Find $\displaystyle\int \cos 6x \sqrt{1 + \sin 6x} \, dx$

37. Find $\int \dfrac{\left(x^4 - x\right)^{\frac{1}{4}}}{x^5}\,dx$

38. Find $\int \dfrac{x^4 dx}{(x-1)(x^2+1)}$

39. Find $\int \left[\sin(\log x) + \dfrac{1}{(\log x)^2}\right] dx$

40. Find $\int \left[\sqrt{\cot x} + \sqrt{\tan x}\right] dx$

41. Find $\displaystyle\int \frac{\sin 2x \cos 2x \, dx}{\sqrt{9 - \cos^4(2x)}}$

42. Evaluate $\displaystyle\int_{-1}^{\frac{3}{2}} |x \sin \pi x| \, dx$

43. Evaluate $\displaystyle\int_{0}^{\pi} \frac{x \, dx}{a^2 \cos^2 x + b^2 \sin^2 x}$

Exercise 7 1

1. Find an anti derivative (or integral) of the following functions by the method of inspection.

sin 2x

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2. Find an anti derivative (or integral) of the following functions by the method of inspection.

cos 3x

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3. Find an anti derivative (or integral) of the following functions by the method of inspection.

e^{2x}

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4. Find an anti derivative (or integral) of the following functions by the method of inspection.

$(ax + b)^2$

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5. Find an anti derivative (or integral) of the following functions by the method of inspection.

$\sin 2x - 4e^{3x}$

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6. Find the following integrals

$\int \left(4e^{3x} + 1\right) dx$

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7. Find the following integrals

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

8. Find the following integrals

$$\int (ax^2 + bx + c) dx$$

9. Find the following integrals

$$\int (2x^2 + e^x) dx$$

10. Find the following integrals

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

11. $\int \dfrac{x^3 + 5x^2 - 4}{x^2} dx$

12. Find the following integrals

$$\int \frac{x^3 + 3x + 4}{\sqrt{x}} dx$$

13. Find the following integrals

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

14. Find the following integrals

$$\int (1 - x)\sqrt{x}\,dx$$

15. Find the following integrals

$$\int \sqrt{x}\left(3x^2 + 2x + 3\right) dx$$

16. Find the following integrals

$$\int (2x - 3\cos x + e^x)\,dx$$

17. Find the following integrals

$$\int (2x^2 - 3\sin x + 5\sqrt{x})\,dx$$

18. Find the following integrals

$$\int \sec x (\sec x + \tan x)\,dx$$

19. Find the following integrals

$$\int \frac{\sec^2 x}{\cos ec^2 x} dx$$

20. Find the following integrals

$$\int \frac{2 - 3\sin x}{\cos^2 x} dx$$

21. Choose the correct answer

The anti derivative of $\left(\sqrt{x} + \dfrac{1}{\sqrt{x}} \right)$ equals

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

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

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

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

Answer: C

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22. Choose the correct answer

If $\dfrac{d}{dx}f(x) = 4x^3 - \dfrac{3}{x^4}$ such that f (2) = 0. Then f (x) is

A. $x^4 + \dfrac{1}{x^3} - \dfrac{129}{8}$

B. $x^3 + \dfrac{1}{x^4} + \dfrac{129}{8}$

C. $x^4 + \dfrac{1}{x^3} + \dfrac{129}{8}$

D. $x^3 + \dfrac{1}{x^4} - \dfrac{129}{8}$

Answer: A

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1. Integrate the functions

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

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2. Integrate the functions

$$\frac{(\log x)^2}{x}$$

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3. Integrate the functions

$$\frac{1}{x + x \log x}$$

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4. Integrate the functions

$$\sin x \sin(\cos x)$$

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5. Integrate the functions

$$\sin(ax + b)\cos(ax + b)$$

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6. Integrate the functions

$$\sqrt{ax + b}$$

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7. Integrate the functions

$$x\sqrt{x + 2}$$

8. Integrate the functions

$$x\sqrt{1 + 2x^2}$$

9. Integrate the functions

$$(4x + 2)\sqrt{x^2 + x + 1}$$

10. Integrate the functions

$$\frac{1}{x - \sqrt{x}}$$

11. Integrate the functions

$$\frac{x}{\sqrt{x+4}}, \, x > 0$$

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12. Integrate the functions

$$\left(x^3 - 1\right)^{\frac{1}{3}} x^5$$

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13. Integrate the functions

$$\frac{x^2}{\left(2 + 3x^3\right)^3}$$

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14. Integrate the functions

$$\frac{1}{x(\log x)^m}, \, x > 0, m \neq 1$$

15. Integrate the functions

$$\frac{x}{9 - 4x^2}$$

16. Integrate the functions

$$e^{2x+3}$$

17. Integrate the functions

$$\frac{x}{e^{x^2}}$$

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18. Integrate the functions

$$\frac{e^{\tan^{-1}x}}{1+x^2}$$

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19. Integrate the functions

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

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20. Integrate the functions

$$\frac{e^{2x} - e^{-2x}}{e^{2x} + e^{-2x}}$$

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21. Integrate the functions

$$\tan^2(2x - 3)$$

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22. Integrate the functions

$$\sec^2(7 - 4x)$$

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23. Integrate the functions

$$\frac{\sin^{-1} x}{\sqrt{1 - x^2}}$$

24. Integrate the functions

$$\frac{2 \cos x - 3 \sin x}{6 \cos x + 4 \sin x}$$

25. Integrate the functions

$$\frac{1}{\cos^2 x (1 - \tan x)^2}$$

26. Integrate the functions

$$\frac{\cos \sqrt{x}}{\sqrt{x}}$$

27. Integrate the functions

$$\sqrt{\sin 2x} \cos 2x$$

28. Integrate the functions

$$\frac{\cos x}{\sqrt{1 + \sin x}}$$

29. Integrate the functions

cot x log sin x

30. Integrate the functions

$$\frac{\sin x}{1 + \cos x}$$

31. Integrate the functions

$$\frac{\sin x}{(1 + \cos x)^2}$$

32. Integrate the functions

$$\frac{1}{1 + \cot x}$$

33. Integrate the functions

$$\frac{1}{1 - \tan x}$$

34. Integrate the functions

$$\frac{\sqrt{\tan x}}{\sin x \cos x}$$

35. Integrate the functions

$$\frac{(1 + \log x)^2}{x}$$

36. Integrate the functions

$$\frac{(x + 1)(x + \log x)^2}{x}$$

37. Integrate the functions

$$\frac{x^3 \sin(\tan^{-1} x^4)}{1 + x^8}$$

38. Choose the correct answer

$$\int \frac{10x^9 + 10^x \log_e 10 dx}{x^{10} + 10^x} \text{ equals}$$

A. $10^x - x^{10} + C$

B. $10^x + x^{10} + C$

C. $\left(10^x - x^{10}\right)^{-1} + C$

D. $\log\left(10^x + x^{10}\right) + C$

Answer: D

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39. Choose the correct answer

$$\int \frac{dx}{\sin^2 x \cos^2 x} \text{ equals}$$

A. tan x + cot x + C

B. tan x − cot x + C

C. tan x cot x + C

D. tan x – cot 2x + C

Answer: B

Exercise 7 3

1. Find the integrals of the functions

$$\sin^2(2x + 5)$$

2. Find the integrals of the functions

sin 3x cos 4x

3. Find the integrals of the functions

cos 2x cos 4x cos 6x

4. Find the integrals of the functions

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

5. Find the integrals of the functions

$$\sin^3 x \cos^3 x$$

6. Find the integrals of the functions

sin x sin 2x sin 3x

7. Find the integrals of the functions

sin 4x sin 8x

8. Find the integrals of the functions
$$\frac{1 - \cos x}{1 + \cos x}$$

9. Find the integrals of the functions

$$\frac{\cos x}{1 + \cos x}$$

10. Find the integrals of the functions

$$\sin^4 x$$

11. Find the integrals of the functions

$$\cos^4 2x$$

12. Find the integrals of the functions

$$\frac{\sin^2 x}{1 + \cos x}$$

13. Find the integrals of the functions

$$\frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha}$$

14. Find the integrals of the functions

$$\frac{\cos x - \sin x}{1 + \sin 2x}$$

15. Find the integrals of the functions

$$\tan^3 2x \sec 2x$$

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16. Find the integrals of the functions

$$\tan^4 x$$

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17. Find the integrals of the functions

$$\frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x}$$

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18. Find the integrals of the functions

$$\frac{\cos 2x + 2\sin^2 x}{\cos^2 x}$$

19. Find the integrals of the functions

$$\frac{1}{\sin x \cos^3 x}$$

20. Find the integrals of the functions

$$\frac{\cos 2x}{(\cos x + \sin x)^2}$$

21. Find the integrals of the functions

$\sin^{-1}(\cos x)$

22. Find the integrals of the functions

$$\frac{1}{\cos(x-a)\cos(x-b)}$$

23. Choose the correct answer

$\int \dfrac{\sin^2 x - \cos^2 x}{\sin^2 x \cos^2 x} dx$ is equal to

A. tan x + cot x + C

B. tan x + cosec x + C

C. $-\tan x + \cot x + C$

D. tan x + sec x + C

24. Choose the correct answer

$$\int \frac{e^x(1+x)}{\cos^2(e^x x)} dx \text{ equals}$$

A. $-\cot(ex^x) + C$

B. $\tan(xe^x) + C$

C. $\tan(e^x) + C$

D. $\cot(e^x) + C$

1. Integrate the function

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

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2. Integrate the function

$$\frac{1}{\sqrt{1 + 4x^2}}$$

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3. Integrate the function

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

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4. Integrate the function

$$\frac{1}{\sqrt{9 - 25x^2}}$$

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5. Integrate the function

$$\frac{3x}{1 + 2x^4}$$

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6. Integrate the function

$$\frac{x^2}{1 - x^6}$$

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7. Integrate the function

$$\frac{x - 1}{\sqrt{x^2 - 1}}$$

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8. Integrate the function

$$\frac{x^2}{\sqrt{x^6 + a^6}}$$

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9. Integrate the function

$$\frac{\sec^2 x}{\sqrt{\tan^2 x + 4}}$$

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10. Integrate the function

$$\frac{1}{\sqrt{x^2 + 2x + 2}}$$

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11. Integrate the function

$$\frac{1}{9x^2 + 6x + 5}$$

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12. Integrate the function

$$\frac{1}{\sqrt{7 - 6x - x^2}}$$

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13. Integrate the function

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

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14. Integrate the function

$$\frac{1}{\sqrt{8+3x-x^2}}$$

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15. Integrate the function

$$\frac{1}{\sqrt{(x-a)(x-b)}}$$

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16. Integrate the function

$$\frac{4x + 1}{\sqrt{2x^2 + x - 3}}$$

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17. Integrate the function

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

▶ Watch Video Solution

18. Integrate the function

$$\frac{5x - 2}{1 + 2x + 3x^2}$$

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19. Integrate the function

$$\frac{6x + 7}{\sqrt{(x - 5)(x - 4)}}$$

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20. Integrate the function

$$\frac{x + 2}{\sqrt{4x - x^2}}$$

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21. Integrate the function

$$\frac{x + 2}{\sqrt{x^2 + 2x + 3}}$$

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22. Integrate the function

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

23. Integrate the function

$$\frac{5x+3}{\sqrt{x^2 + 4x + 10}}$$

24. Choose the correct answer

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

A. $x \tan^{-1}(x+1) + C$

B. $\tan^{-1}(x+1) + C$

C. $(x+1)\tan^{-1} x + C$

D. $\tan^{-1} x + C$

Answer: B

25. Choose the correct answer

$$\int \frac{dx}{\sqrt{9x - 4x^2}} \text{ equals}$$

A. $\dfrac{1}{9} \sin^{-1} \left(\dfrac{9x - 8}{8} \right) + C$

B. $\dfrac{1}{2} \sin^{-1} \left(\dfrac{8x - 9}{9} \right) + C$

C. $\dfrac{1}{3} \sin^{-1} \left(\dfrac{9x - 8}{8} \right) + C$

D. $\dfrac{1}{2} \sin^{-1} \left(\dfrac{9x - 8}{9} \right) + C$

Answer: B

1. Integrate the rational functions

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

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2. Integrate the rational functions

$$\frac{1}{x^2 - 9}$$

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3. Integrate the rational functions

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

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4. Integrate the rational functions

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

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5. Integrate the rational functions

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

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6. Integrate the rational functions

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

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7. Integrate the rational functions

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

8. Integrate the rational functions

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

9. Integrate the rational functions

$$\frac{3x + 5}{x^3 - x^2 - x + 1}$$

10. Integrate the rational functions

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

11. Integrate the rational functions

$$\frac{5x}{(x + 1)(x^2 - 4)}$$

12. Integrate the rational functions

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

13. Integrate the rational functions

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

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14. Integrate the rational functions

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

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15. Integrate the rational functions

$$\frac{1}{x^4-1}$$

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16. Integrate the rational functions

$$\frac{1}{x(x^n + 1)}$$ [Hint: multiply numerator and denominator by x^{n-1} and

put $x^n = t$]

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17. $$\frac{\cos x}{(1 - \sin x)(2 - \sin x)}$$ [Hint : Put sin x = t]

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18. Integrate the rational functions

$$\frac{(x^2 + 1)(x^2 + 2)}{(x^2 + 3)(x^2 + 4)}$$

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19. Integrate the rational functions

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

20. Integrate the rational functions

$$\frac{1}{x(x^4-1)}$$

21. Integrate the rational functions

$$\frac{1}{(e^x-1)}$$ [Hint : Put e^x = t]

22. Choose the correct answer

$$\int \frac{x\,dx}{(x-1)(x-2)} \text{ equals}$$

A. $\log\left|\dfrac{(x-1)^2}{x-2}\right| + C$

B. $\log\left|\dfrac{(x-2)^2}{x-1}\right| + C$

C. $\log\left|\left(\dfrac{x-1}{x-2}\right)^2\right| + C$

D. $\log|(x-1)(x-2)| + C$

Answer: B

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23. Choose the correct answer

$$\int \frac{dx}{x(x^2+1)} \text{ equals}$$

A. $\log|x| - \dfrac{1}{2}\log(x^2+1) + C$

B. $\log|x| + \dfrac{1}{2}\log(x^2+1) + C$

C. $-\log|x| + \dfrac{1}{2}\log(x^2 + 1) + C$

D. $\dfrac{1}{2}\log|x| + \log(x^2 + 1) + C$

Answer: A

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Exercise 7 6

1. Integrate the functions

$x \sin x$

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2. Integrate the functions

$x \sin 3x$

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3. Integrate the functions

$$x^2 e^x$$

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4. Integrate the functions

$$x \log x$$

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5. Integrate the functions

$$x \log 2x$$

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6. Integrate the functions

$$x^2 \log x$$

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7. Integrate the functions

$$x \sin^{-1} x$$

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8. Integrate the functions

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

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9. Integrate the functions

$$x \cos^{-1} x$$

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10. Integrate the functions

$$\left(\sin^{-1} x\right)^2$$

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11. Integrate the functions

$$\frac{x \cos^{-1} x}{\sqrt{1 - x^2}}$$

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12. Integrate the functions

$$x \sec^2 x$$

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13. Integrate the functions

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

▶ Watch Video Solution

14. Integrate the functions

$$x (\log x)^2$$

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15. Integrate the functions

$$(x^2 + 1)\log x$$

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16. Integrate the functions

$$e^x (\sin x + \cos x)$$

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17. Integrate the functions

$$\frac{xe^x}{(1+x)^2}$$

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18. Integrate the functions

$$e^x \left(\frac{1 + \sin x}{1 + \cos x} \right)$$

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19. Integrate the functions

$$e^x \left(\frac{1}{x} - \frac{1}{x^2} \right)$$

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20. Integrate the functions

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

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21. Integrate the functions

$e^{2x} \sin x$

22. Integrate the functions

$\sin^{-1}\left(\dfrac{2x}{1 + x^2}\right)$

23. Choose the correct answer

$\displaystyle\int x^2 e^{x^3}\, dx$ equals

A. $\dfrac{1}{3}e^{x^3} + C$

B. $\dfrac{1}{3}e^{x^2} + C$

C. $\dfrac{1}{2}e^{x^3} + C$

D. $\dfrac{1}{2}e^{x^2} + C$

Answer: A

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24. Choose the correct answer

$\displaystyle\int e^x \sec x (1 + \tan x) dx$ equals

    A. $e^x \cos x + C$

    B. $e^x \sec x + C$

    C. $e^x \sin x + C$

    D. $e^x \tan x + C$

Answer: B

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1. Integrate the functions

$$\sqrt{4 - x^2}$$

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2. Integrate the functions

$$\sqrt{1 - 4x^2}$$

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3. Integrate the functions

$$\sqrt{x^2 + 4x + 6}$$

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4. Integrate the functions

$$\sqrt{x^2 + 4x + 1}$$

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5. Integrate the functions

$$\sqrt{1 - 4x - x^2}$$

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6. Integrate the functions

$$\sqrt{x^2 + 4x - 5}$$

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7. Integrate the functions

$$\sqrt{1 + 3x - x^2}$$

8. Integrate the functions

$$\sqrt{x^2 + 3x}$$

9. Integrate the functions

$$\sqrt{1 + \frac{x^2}{9}}$$

10. Choose the correct answer

$\int \sqrt{1 + x^2} dx$ is equal to

A. $\dfrac{x}{2}\sqrt{1 + x^2} + \dfrac{1}{2}\log\left|\left(x + \sqrt{1 + x^2}\right)\right| + C$

B. $\dfrac{2}{3}\left(1+x^2\right)^{\frac{3}{2}}+C$

C. $\dfrac{2}{3}x\left(1+x^2\right)^{\frac{3}{2}}+C$

D. $\dfrac{x^2}{2}\sqrt{1+x^2}+\dfrac{1}{2}x^2\log\left|x+\sqrt{1+x^2}\right|+C$

Answer: A

11. Choose the correct answer

$\displaystyle\int\sqrt{x^2-8x+7}\,$ dx is equal to

A.

$\dfrac{1}{2}(x-4)\sqrt{x^2-8x+7}+9\log\left|x-4+\sqrt{x^2-8x+7}\right|+C$

B.

$\dfrac{1}{2}(x+4)\sqrt{x^2-8x+7}+9\log\left|x+4+\sqrt{x^2-8x+7}\right|+C$

C.

$$\frac{1}{2}(x-4)\sqrt{x^2-8x+7} - 3\sqrt{2}\log\left|x-4+\sqrt{x^2-8x+7}\right| + C$$

D.

$$\frac{1}{2}(x-4)\sqrt{x^2-8x+7} - \frac{9}{2}\log\left|x-4+\sqrt{x^2-8x+7}\right| + C$$

Answer: B

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Exercise 7 8

1. Evaluate the following definite integrals as limit of sums.

$$\int_a^b x\,dx$$

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2. Evaluate the following definite integrals as limit of sums.

$$\int_0^5 (x+1)\,dx$$

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3. Evaluate the following definite integrals as limit of sums.

$$\int_2^3 x^2\,dx$$

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4. Evaluate the following definite integrals as limit of sums.

$$\int_1^4 \left(x^2 - x\right)dx$$

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5. Evaluate the following definite integrals as limit of sums.

$$\int_{-1}^{1} e^x \, dx$$

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6. Evaluate the following definite integrals as limit of sums.

$$\int_{0}^{4} \left(x + e^{2x} \right) dx$$

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Exercise 7 9

1. Evaluate the definite integrals

$$\int_{-1}^{1} (x + 1) \, dx$$

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2. Evaluate the definite integrals

$$\int_2^3 \frac{1}{x}\,dx$$

3. Evaluate the definite integrals

$$\int_1^2 \left(4x^3 - 5x^2 + 6x + 9\right)dx$$

4. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} \sin 2x\,dx$$

5. Evaluate the definite integrals

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

6. Evaluate the definite integrals

$$\int_4^5 e^x \, dx$$

7. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} \tan x \, dx$$

8. Evaluate the definite integrals

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \cos ecx dx$$

9. Evaluate the definite integrals

$$\int_{0}^{1} \frac{dx}{\sqrt{1+x^2}}$$

10. Evaluate the definite integrals

$$\int_{0}^{1} \frac{dx}{1+x^2}$$

11. Evaluate the definite integrals

$$\int_2^3 \frac{dx}{x^2 - 1}$$

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12. Evaluate the definite integrals

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

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13. Evaluate the definite integrals

$$\int_2^3 \frac{x \, dx}{x^2 + 1}$$

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14. Evaluate the definite integrals

$$\int_0^1 \frac{2x+3}{5x^2+1}\,dx$$

15. Evaluate the definite integrals

$$\int_0^1 xe^{x^2}\,dx$$

16. Evaluate the definite integrals

$$\int_1^2 \frac{5x^2}{x^2+4x+3}$$

17. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} \left(2\sec^2 x + x^3 + 2\right) dx$$

18. Evaluate the definite integrals

$$\int_0^{\pi} \left(\frac{\sin^2 x}{2} - \frac{\cos^2 x}{2}\right) dx$$

19. Evaluate the definite integrals

$$\int_0^2 \frac{6x + 3}{x^2 + 4} dx$$

20. Evaluate the definite integrals

$$\int_0^1 \left(xe^x + \frac{\sin(\pi x)}{4} \right) dx$$

21. Choose the correct answer

$$\int_1^{\sqrt{3}} \frac{dx}{1 + x^2} \text{ equals}$$

A. $\dfrac{\pi}{3}$

B. $\dfrac{2\pi}{3}$

C. $\dfrac{\pi}{6}$

D. $\dfrac{\pi}{12}$

Answer: D

22. Choose the correct answer

$$\int_0^{\frac{2}{3}} \frac{dx}{4 + 9x^2} \text{ equals}$$

A. $\dfrac{\pi}{6}$

B. $\dfrac{\pi}{12}$

C. $\dfrac{\pi}{24}$

D. $\dfrac{\pi}{4}$

Answer: C

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Exercise 7 10

1. Evaluate the integrals by using substitution

$$\int_0^1 \frac{x}{x^2 + 1} dx$$

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2. Evaluate the integrals by using substitution

$$\int_0^{\frac{\pi}{2}} \sqrt{\sin \phi} \cos^5 \phi d\phi$$

3. Evaluate the integrals by using substitution

$$\int_0^1 \sin^{-1}\left(\frac{2x}{1+x^2}\right) dx$$

4. Evaluate the integrals by using substitution

$$\int_0^2 x\sqrt{x+2} \text{ (Put x + 2 = } t^2)$$

5. Evaluate the integrals by using substitution

$$\int_0^{\frac{\pi}{2}} \frac{\sin x}{1 + \cos^2 x} dx$$

6. Evaluate the integrals by using substitution

$$\int_0^2 \frac{dx}{x + 4 - x^2}$$

7. Evaluate the integrals by using substitution

$$\int_{-1}^1 \frac{dx}{x^2 + 2x + 5}$$

8. Evaluate the integrals by using substitution

$$\int_1^2 \left(\frac{1}{x} - \frac{1}{2x^2} \right) e^{2x} dx$$

9. Choose the correct answer

The value of the integral $\int_{\frac{1}{3}}^1 \frac{(x - x^3)^{\frac{1}{3}}}{x^4} dx$ is

A. 6

B. 0

C. 3

D. 4

Answer: A

10. Choose the correct answer

If f(x)= $\int_0^x t \sin t \, dt$, then f' (x) is

    A. cosx + x sin x

    B. x sinx

    C. x cosx

    D. sinx + x cosx

Answer: B

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Exercise 7 11

1. By using the properties of definite integrals, evaluate the integrals

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

2. By using the properties of definite integrals, evaluate the integrals

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

3. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} \frac{\sin^{\frac{3}{2}} x dx}{\sin^{\frac{3}{2}} x + \cos^{\frac{3}{2}} x}$$

4. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} \frac{\cos^5 x dx}{\sin^5 x + \cos^5 x}$$

5. By using the properties of definite integrals, evaluate the integrals

$$\int_{-5}^{5} |x + 2| dx$$

6. By using the properties of definite integrals, evaluate the integrals

$$\int_{2}^{8} |x - 5| dx$$

7. $\int_{0}^{1} x(1 - x)^n dx$

8. By using the properties of definite integrals, evaluate the integrals

$$\int_{0}^{\frac{\pi}{4}} \log(1 \tan x) dx$$

9. By using the properties of definite integrals, evaluate the integrals

$$\int_0^2 x\sqrt{2-x}\,dx$$

10. By using the properties of definite integrals, evaluate the integrals

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

11. By using the properties of definite integrals, evaluate the integrals

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^2 x\,dx$$

12. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\pi} \frac{x\,dx}{1+\sin x}$$

13. By using the properties of definite integrals, evaluate the integrals

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x\,dx$$

14. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{2\pi} \cos^5 x\,dx$$

15. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\frac{\pi}{2}} \frac{\sin x - \cos x}{1 + \sin x \cos x}\,dx$$

16. By using the properties of definite integrals, evaluate the integrals

$$\int_0^{\pi} \log(1 + \cos x)\,dx$$

17. By using the properties of definite integrals, evaluate the integrals

$$\int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}}\,dx$$

18. By using the properties of definite integrals, evaluate the integrals

$$\int_0^4 |x - 1|\,dx$$

19. Show that $\int_0^a f(x)g(x)\,dx = 2\int_0^a f(x)\,dx$, if f and g are defined as f (x) = f (a - x) and g(x) + g(a - x) = 4

20. Choose the correct answer

The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left(x^3 + x \cos x + \tan^5 x + 1\right) dx$ is

A. 0

B. 2

C. π

D. 1

Answer: C

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21. Choose the correct answer

The value of $\int_0^{\frac{\pi}{2}} \log\left(\dfrac{4 + 3\sin x}{4 + 3\cos x}\right) dx$ is

A. 2

B. $\dfrac{3}{4}$

C. 0

D. -2

Answer: C

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Exercise 7 12

1. Integrate the functions

$$\dfrac{1}{x - x^3}$$

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2. Integrate the functions

$$\dfrac{1}{\sqrt{x + a} + \sqrt{x + b}}$$

3. Integrate the functions

$$\frac{1}{x\sqrt{ax - x^2}} \text{ [Hint: Put x } = \frac{a}{t}]$$

4. Integrate the functions

$$\frac{1}{x^2(x^4 + 1)^{\frac{3}{4}}}$$

5. Integrate the functions

$$\frac{1}{x^{\frac{1}{2}} + x^{\frac{1}{3}}} \text{ [Hint: } \frac{1}{x^{\frac{1}{2}} + x^{\frac{1}{3}}} = \frac{1}{x^{\frac{1}{3}}\left(1 + x^{\frac{1}{6}}\right)}, \text{ put } x = t^6]$$

6. Integrate the functions

$$\frac{5x}{(x+1)(x^2+9)}$$

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7. Integrate the functions

$$\frac{\sin x}{\sin(x-a)}$$

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8. Integrate the functions

$$\frac{e^{5\log x} - e^{4\log x}}{e^{3\log x} - e^{2\log x}}$$

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9. Integrate the functions

$$\frac{\cos x}{\sqrt{4 - \sin^2 x}}$$

10. Integrate the functions

$$\frac{\sin^8 - \cos^8 x}{1 - 2\sin^2 x \cos^2 x}$$

11. Integrate the functions

$$\frac{1}{\cos(x + a)\cos(x + b)}$$

12. Integrate the functions

$$\frac{x^3}{\sqrt{1-x^8}}$$

13. Integrate the functions

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

14. Integrate the functions

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

15. Integrate the functions

$$\cos^3 x e^{\log \sin x}$$

16. Integrate the functions

$$e^{3 \log x} \left(x^4 + 1\right)^{-1}$$

17. Integrate the functions

$$f'(ax + b)[f(ax + b)]^n$$

18. Integrate the functions

$$\frac{1}{\sqrt{\sin^3 x \sin(x + \alpha)}}$$

19. Integrate the functions

$$\frac{\sin^{-1}\sqrt{x} - \cos^{-1}\sqrt{x}}{\sin^{-1}\sqrt{x} + \cos^{-1}\sqrt{x}}.$$

20. Integrate the functions

$$\sqrt{\frac{1 - \sqrt{x}}{1 + \sqrt{x}}}$$

21. Integrate the functions

$$\frac{2 + \sin 2x}{1 + \cos 2x} e^x$$

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22. Integrate the functions

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

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23. Integrate the functions

$$\tan^{-1} \sqrt{\frac{1 - x}{1 + x}}$$

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24. Integrate the functions

$$\frac{\sqrt{x^2 + 1}\left[\log(x^2 + 1) - 2\log x\right]}{x^4}$$

25. Evaluate the definite integrals

$$\int_{\frac{\pi}{2}}^{\pi} e^x \left(\frac{1 - \sin x}{1 - \cos x}\right) dx$$

26. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} \frac{\sin x \cos x}{\cos^4 x + \sin^4 x} dx$$

27. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{2}} \frac{\cos^2 x\, dx}{\cos^2 x + 4\sin^2 x}$$

28. Evaluate the definite integrals

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$$

29. Evaluate the definite integrals

$$\int_0^1 \frac{dx}{\sqrt{1+x} - \sqrt{x}}$$

30. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{9 + 16\sin 2x}\,dx$$

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31. Evaluate the definite integrals

$$\int_0^{\frac{\pi}{2}} \sin 2x \tan^{-1}(\sin x)\,dx$$

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32. Evaluate the definite integrals

$$\int_0^{\pi} \frac{x \tan x}{\sec x + \tan x}\,dx$$

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33. Evaluate the definite integrals

$$\int_1^4 [|x-1| + |x-2| + |x-3|]dx$$

34. Prove the following

$$\int_0^1 xe^x dx = 1$$

35. Prove the following

$$\int_{-1}^1 x^{17} \cos^4 x dx = 0$$

36. Prove the following

$$\int_0^{\frac{\pi}{4}} 2\tan^3 x \, dx = 1 - \log 2$$

37. Evaluate $\int_0^1 e^{2-3x} dx$ as a limit of a sum.

38. Choose the correct answers

$$\int \frac{dx}{e^x + e^{-x}}$$ is equal to

A. $\tan^{-1}(e^x) + C$

B. $\tan^{-1}(e^{-x}) + C$

C. $\log(e^x - e^{-x}) + C$

D. $\log(e^x + e^{-x}) + C$

Answer: A

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39. Choose the correct answers

$$\int \frac{\cos 2x}{(\sin x + \cos x)^2} dx \text{ is equal to}$$

A. $\dfrac{-1}{\sin x + \cos x} + C$

B. $\log|\sin x + \cos x| + C$

C. $\log|\sin x - \cos x| + C$

D. $\dfrac{1}{(\sin x + \cos x)^2}$

Answer: B

40. Choose the correct answers

If f (a + b - x) = f (x), then $\int_a^b x f(x)\, dx$ is equal to

A. $\dfrac{a+b}{2} \int_a^b f(b-x)\, dx$

B. $\dfrac{a+b}{2} \int_a^b f(b+x)\, dx$

C. $\dfrac{b-a}{2} \int_a^b f(x)\, dx$

D. $\dfrac{a+b}{2} \int_a^b f(x)\, dx$

Answer: D

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41. Choose the correct answers

The value of $\int_0^1 \tan^{-1}\left(\dfrac{2x-1}{1+x-x^2}\right) dx$ is

A. 1

B. 0

C. -1

D. $\dfrac{\pi}{4}$

Answer: B

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