# Indefinite Integration … Set 1

Evaluate the following indefinite integrals:

1. $\displaystyle \int (4x + 3)\, dx$

2. $\displaystyle \int (4x^2 - 8x + 1)\, dx$

3. $\displaystyle \int (9t^2 - 4t + 3)\, dt$

4. $\displaystyle \int (2t^3 - t^2 + 3t - 7)\, dt$

5. $\displaystyle \int \left( \frac{1}{z^3} - \frac{3}{z^2} \right) dz$

6. $\displaystyle \int \left( \frac{4}{z^7} - \frac{7}{z^4} + z \right) dz$

7. $\displaystyle \int \left( 3\sqrt{u} + \frac{1}{\sqrt{u}} \right) du$

8. $\displaystyle \int \left( \sqrt{u^3} - \frac{1}{2} u^{-2} + 5 \right) du$

9. $\displaystyle \int (2v^{5/4} + 6v^{1/4} + 3v^{-4})\, dv$

10. $\displaystyle \int (3v^5 - v^{5/3})\, dv$

11. $\displaystyle \int (3x - 1)^2\, dx$

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

13. $\displaystyle \int x(2x + 3)\, dx$

14. $\displaystyle \int (2x - 5)(3x + 1)\, dx$

15. $\displaystyle \int \frac{8x - 5}{\sqrt[3]{x}}\, dx$

16. $\displaystyle \int \frac{2x^2 - x + 3}{\sqrt{x}}\, dx$

17. $\displaystyle \int \frac{x^3 - 1}{x - 1}\, dx$

18. $\displaystyle \int \frac{x^3 + 3x^2 - 9x - 2}{x - 2}\, dx$

19. $\displaystyle \int \frac{(t^2 + 3)^2}{t^6}\, dt$

20. $\displaystyle \int \frac{(\sqrt{t} + 2)^2}{t^3}\, dt$

# Answers

**Indefinite integrals:**

1. $2x^2 + 3x + C$

2. $\dfrac{4x^3}{3} - 4x^2 + x + C$

3. $3t^3 - 2t^2 + 3t + C$

4. $\dfrac{t^4}{2} - \dfrac{t^3}{3} + \dfrac{3t^2}{2} - 7t + C$

5. $-\dfrac{z^{-2}}{2} + 3z^{-1} + C$

6. $-\dfrac{4z^{-6}}{6} + \dfrac{7z^{-3}}{3} + \dfrac{z^2}{2} + C$

7. $2u^{3/2} + 2u^{1/2} + C$

8. $\dfrac{2u^{5/2}}{5} + \dfrac{u^{-1}}{2} + 5u + C$

9. $\dfrac{8v^{9/4}}{9} + \dfrac{24v^{5/4}}{5} - v^{-3} + C$

10. $\dfrac{v^6}{2} - \dfrac{3v^{8/3}}{8} + C$

11. $3x^3 - 3x^2 + x + C$

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

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

14. $2x^3 - \dfrac{13x^2}{2} - 5x + C$

15. $\dfrac{24x^{5/3}}{5} - \dfrac{15x^{2/3}}{2} + C$

16. $\dfrac{4x^{5/2}}{5} - \dfrac{2x^{3/2}}{3} + 6x^{1/2} + C$

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

18. $\dfrac{x^3}{3} + \dfrac{5x^2}{2} + x + C$

19. $-t^{-1} - 2t^{-3} - \dfrac{9t^{-5}}{5} + C$

20. $-t^{-1} - \dfrac{8t^{-3/2}}{3} - 2t^{-2} + C$

# Indefinite Integration ... Set 1

Evaluate the following indefinite integrals:

21. $\displaystyle\int \frac{3}{4}\cos u\,du$

22. $\displaystyle\int -\frac{1}{5}\sin u\,du$

23. $\displaystyle\int \frac{7}{\csc x}\,dx$

24. $\displaystyle\int \frac{1}{4\sec x}\,dx$

25. $\displaystyle\int \left(\sqrt{t}+\cos t\right)dt$

26. $\displaystyle\int \left(\sqrt[3]{t^2}-\sin t\right)dt$

27. $\displaystyle\int \frac{\sec t}{\cos t}\,dt$

28. $\displaystyle\int \frac{1}{\sin^2 t}\,dt$

29. $\displaystyle\int \left(\csc v\cot v\sec v\right)dv$

30. $\displaystyle\int \left(4+4\tan^2 v\right)dv$

31. $\displaystyle\int \frac{\sec w\sin w}{\cos w}\,dw$

32. $\displaystyle\int \frac{\csc w\cos w}{\sin w}\,dw$

33. $\displaystyle\int \frac{(1+\cot^2 z)\cot z}{\csc z}\,dz$

34. $\displaystyle\int \frac{\tan z}{\cos z}\,dz$

35. $\displaystyle\int \frac{d}{dx}\sqrt{x^2+4}\,dx$

36. $\displaystyle\int \frac{d}{dx}\sqrt[3]{x^3-8}\,dx$

37. $\displaystyle\int \frac{d}{dx}\sin\sqrt[3]{x}\,dx$

38. $\displaystyle\int \frac{d}{dx}\sqrt{\tan x}\,dx$

39. $\displaystyle\frac{d}{dx}\int x^3\sqrt{x-4}\,dx$

40. $\displaystyle\frac{d}{dx}\int x^4\sqrt[3]{x^2+9}\,dx$

## Answers

**Indefinite integrals:**

21. $\dfrac{3}{4}\sin u + C$

22. $\dfrac{1}{5}\cos u + C$

23. $-7\cos x + C$

24. $\dfrac{1}{4}\sin x + C$

25. $\dfrac{2t^{3/2}}{3} + \sin t + C$

26. $\dfrac{3t^{5/3}}{5} + \cos t + C$

27. $\tan t + C$

28. $-\cot t + C$

29. $-\cot v + C$

30. $4\tan v + C$

31. $\sec w + C$

32. $-\csc w + C$

33. $-\csc z + C$

34. $\sec z + C$

35. $\sqrt{x^2 + 4} + C$

36. $\sqrt[3]{x^3 - 8} + C$

37. $\sin \sqrt[3]{x} + C$

38. $\sqrt{\tan x} + C$

39. $x^3 \sqrt{x - 4}$

40. $x^4 \sqrt[3]{x^2 + 9}$

Evaluate the following indefinite integrals:

41. $\dfrac{d}{dx} \displaystyle\int \cot x^3\, dx$

42. $\dfrac{d}{dx} \displaystyle\int \cos \sqrt{x^2 + 1}\, dx$

Solve the differential equation subject to the given conditions:

43. $f'(x) = 12x^2 - 6x + 1 \qquad f(1) = 5$

44. $f'(x) = 9x^2 + x - 8 \qquad f(-1) = 1$

45. $\dfrac{dy}{dx} = 4x^{1/2} \qquad y = 21$ when $x = 4$

# Answers

**Indefinite integrals:**

41. $\cot x^3$

42. $\cos \sqrt{x^2 + 1}$

**Differential equations:**

43. $f(x) = 4x^3 - 3x^2 + x + 3$

44. $f(x) = 3x^3 + \dfrac{x^2}{2} - 8x - \dfrac{9}{2}$

45. $y(x) = \dfrac{8x^{3/2}}{3} - \dfrac{1}{3}$