Basic Integration Problems

I. Find the following integrals.

1. $\int(5x^2 - 8x + 5)dx$

2. $\int(-6x^3 + 9x^2 + 4x - 3)dx$

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

4. $\int\left(\frac{8}{x} - \frac{5}{x^2} + \frac{6}{x^3}\right)dx$

5. $\int(\sqrt{x} + \frac{1}{3\sqrt{x}})dx$

6. $\int(12x^{\frac{3}{4}} - 9x^{\frac{5}{3}})dx$

7. $\int\frac{x^2 + 4}{x^2}dx$

8. $\int\frac{1}{x\sqrt{x}}dx$

9. $\int(1+3t)t^2\,dt$

10. $\int(2t^2 - 1)^2\,dt$

Antiderivatives (… Introduction to Integration) … Set 2

Answers

I. Find the following integrals.

1. $\int(5x^2-8x+5)dx=\boxed{\frac{5x^3}{3}-4x^2+5x+C}$

2. $\int(-6x^3+9x^2+4x-3)dx=\boxed{\frac{-3x^4}{2}+3x^3+2x^2-3x+C}$

3. $\int(x^{\frac{3}{2}}+2x+3)dx=\boxed{\frac{2x^{\frac{5}{2}}}{5}+x^2+3x+C}$

4. $\int\left(\frac{8}{x}-\frac{5}{x^2}+\frac{6}{x^3}\right)dx=\int\left(\frac{8}{x}-5x^{-2}+6x^{-3}\right)dx$

$=8Ln(x)-\frac{5x^{-1}}{-1}+\frac{6x^{-2}}{-2}=\boxed{8Ln(x)+\frac{5}{x}-\frac{3}{x^2}+C}$

5. $\int(\sqrt{x}+\frac{1}{3\sqrt{x}})dx=\int\left(x^{\frac{1}{2}}+\frac{1}{3}x^{-\frac{1}{2}}\right)dx$

$=\frac{x^{\frac{3}{2}}}{\frac{3}{2}}+\frac{1}{3}\frac{x^{\frac{1}{2}}}{\frac{1}{2}}=\boxed{\frac{2}{3}x^{\frac{3}{2}}+\frac{2}{3}x^{\frac{1}{2}}+C}$

6. $\int(12x^{\frac{3}{4}}-9x^{\frac{5}{3}})dx=\boxed{\frac{48x^{\frac{7}{4}}}{7}-\frac{27x^{\frac{8}{3}}}{8}+c}$

7. $\int\frac{x^2+4}{x^2}dx=\int 1+4x^{-2}\ dx=\boxed{x-\frac{4}{x}+C}$

8. $\int\frac{1}{x\sqrt{x}}dx=\int x^{-\frac{3}{2}}dx=\boxed{-\frac{2}{\sqrt{x}}+C}$

9. $\int(1+3t)t^2\,dt=\int t^2+3t^3\ dt=\boxed{\frac{t^3}{3}+\frac{3t^4}{4}+C}$

10. $\int(2t^2-1)^2\,dt=\int 4t^4-4t^2+1\ dt=\boxed{\frac{4t^5}{5}-\frac{4t^3}{3}+t+C}$

Antiderivatives (… Introduction to Integration) … Set 2

11. $\int y^2 \sqrt[3]{y}\, dy$

12. $\int d\theta$

13. $\int 7\sin(x)dx$

14. $\int 5\cos(\theta)d\theta$

15. $\int 9\sin(3x)dx$

16. $\int 12\cos(4\theta)d\theta$

17. $\int 7\cos(5x)dx$

18. $\int 4\sin\left(\frac{x}{3}\right)dx$

19. $\int 4e^{-7x}dx$

20. $\int 9e^{\frac{x}{4}}dx$

21. $\int -5\cos\ \pi x\ dx$

22. $\int -13e^{6t}dt$

Antiderivatives (… Introduction to Integration) … Set 2

Answers

11. $\int y^2 \sqrt[3]{y}\, dy = \int y^{\frac{7}{3}} dy = \boxed{\frac{3y^{\frac{10}{3}}}{10} + C}$

12. $\int d\theta = \boxed{\theta + C}$

13. $\int 7\sin(x)dx = \boxed{-7\cos(x) + C}$

14. $\int 5\cos(\theta)d\theta = \boxed{5\sin(\theta) + C}$

15. $\int 9\sin(3x)dx = \boxed{-3\cos(3x) + C}$

16. $\int 12\cos(4\theta)d\theta = \boxed{3\sin\ 4\theta\ + C}$

17. $\int 7\cos(5x)dx = \boxed{\frac{7\sin(5x)}{5} + C}$

18. $\int 4\sin\left(\frac{x}{3}\right)dx = \boxed{-12\cos\left(\frac{x}{3}\right) + C}$

19. $\int 4e^{-7x}dx = \boxed{-\frac{4e^{-7x}}{7} + C}$

20. $\int 9e^{\frac{x}{4}}dx = \boxed{36e^{\frac{x}{4}} + C}$

21. $\int -5\cos\ \pi x\ dx = \boxed{-\frac{5\sin(\pi x)}{\pi} + C}$

22. $\int -13e^{6t}dt = \boxed{-\frac{13e^{6t}}{6} + C}$

Antiderivatives (… Introduction to Integration) … Set 2

II. Evaluate the following definite integrals.

1. $\int_{1}^{4}(5x^2-8x+5)dx$

2. $\int_{1}^{9}(x^{\frac{3}{2}}+2x+3)dx$

3. $\int_{4}^{9}(\sqrt{x}+\frac{1}{3\sqrt{x}})dx$

4. $\int_{1}^{4}\frac{5}{x^3}dx$

5. $\int_{-1}^{2}(1+3t)t^2\,dt$

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

Answers

II. Evaluate the following definite integrals.

1. $\int_1^4 (5x^2 - 8x + 5)dx = \left(\frac{5x^3}{3} - 4x^2 + 5x \right)\Big|_1^4 = \frac{188}{3} - \frac{8}{3} = \boxed{60}$

2. $\int_1^9 (x^{\frac{3}{2}} + 2x + 3)dx = \left(\frac{2x^{\frac{5}{2}}}{5} + x^2 + 3x \right)\Big|_1^9 = \frac{1026}{5} - \frac{22}{5} = \boxed{\frac{1001}{5} = 200.2}$

3. $\int_4^9 (\sqrt{x} + \frac{1}{3\sqrt{x}})dx = \left(\frac{2}{3}x^{\frac{3}{2}} + \frac{2}{3}x^{\frac{1}{2}} \right)\Big|_4^9 = 20 - \frac{20}{3} = \boxed{\frac{40}{3} = 13.333}$

4. $\int_1^4 \frac{5}{x^3}dx = -\frac{5}{2x^2}\Big|_1^4 = -\frac{5}{32} + \frac{5}{2} = \boxed{\frac{75}{32} = 2.344}$

5. $\int_{-1}^2 (1 + 3t)t^2\, dt = \left(\frac{t^3}{3} + \frac{3t^4}{4} \right)\Big|_{-1}^2 = \frac{44}{3} - \frac{5}{12} = \boxed{\frac{57}{4} = 14.25}$

6. $\int_{-2}^1 (2t^2 - 1)^2\, dt = \left(\frac{4t^5}{5} - \frac{4t^3}{3} + t \right)\Big|_{-2}^1 = \frac{7}{15} + \frac{254}{15} = \boxed{\frac{87}{5} = 17.4}$