Indefinite Integration - Homework

1. $\int -9\,dx$

$\boxed{-9x + C}$

2. $\int -5x\,dx$

$\boxed{-\frac{5x^2}{2} + C}$

3. $\int (6 + 2x)\,dx$

$\boxed{6x + x^2 + C}$

4. $\int x^7\,dx$

$\boxed{\frac{x^8}{8} + C}$

5. $\int \left(x^4 + x^3 - x^2\right)dx$

$\boxed{\frac{x^5}{5} + \frac{x^4}{4} - \frac{x^3}{3} + C}$

6. $\int \left(3x^3 - 4x^2\right)dx$

$\boxed{\frac{3x^4}{4} - \frac{4x^3}{3} + C}$

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

$\boxed{\frac{x^6}{9} - \frac{5x^2}{4} + \frac{x}{2} + C}$

8. $\int \left(\frac{3}{x^4}\right)dx$

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

9. $\int \left(2 - \frac{1}{x^5} + \frac{7}{x^3}\right)dx$

$\boxed{2x + \frac{1}{4x^4} - \frac{7}{2x^2} + C}$

10. $\int 5\sqrt{x}\,dx$

$\boxed{\frac{10}{3}x^{\frac{3}{2}} + C}$

11. $\int 5\left(\sqrt[5]{x}\right)dx$

$\boxed{\frac{25}{6}x^{\frac{6}{5}} + C}$

12. $\int \left(x^{3/4} - \frac{1}{x^{3/4}}\right)dx$

$\boxed{\frac{4}{7}x^{\frac{7}{4}} - 4x^{\frac{1}{4}} + C}$

13. $\int 3\sqrt[3]{x^2}\,dx$

$\boxed{\frac{9}{5}x^{\frac{5}{3}} + C}$

14. $\int (x-5)^2\,dx$

$\boxed{\begin{array}{l}\int \left(x^2 - 10x + 25\right)dx \\ \frac{x^3}{3} - 5x^2 + 25x + C\end{array}}$

15. $\int 4(3x-2)^3\,dx$

$\boxed{\begin{array}{l}4\int \left(27x^3 - 54x^2 + 36x - 8\right)dx \\ 4\left(\frac{27x^4}{4} - 18x^3 + 18x^3 - 8x + C\right) \\ 27x^4 - 72x^3 + 72x^2 - 32x + C\end{array}}$

16. $\int \frac{x^3 - 4x - 1}{2x^3}\,dx$

$\boxed{\begin{array}{l}\int \left(\frac{1}{2} - \frac{2}{x^2} - \frac{1}{2x^3}\right)dx \\ \frac{1}{2}x + \frac{2}{x} + \frac{1}{4x^2} + C\end{array}}$

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

$\boxed{\begin{array}{l}\int \left(t^4 + 6t^3 + 9t^2\right)dt \\ \frac{t^5}{5} + \frac{3t^4}{2} + 3t^3 + C\end{array}}$

18. $\int \frac{(3x-2)^2}{\sqrt{x}}\,dx$

$\boxed{\begin{array}{l}\int \left(9x^{\frac{3}{2}} - 12x^{\frac{1}{2}} + 4x^{\frac{-1}{2}}\right)dx \\ \frac{18x^{\frac{5}{2}}}{5} - 8x^{\frac{3}{2}} + 8x^{\frac{1}{2}} + C\end{array}}$

19. $\int \frac{3\cos x}{5}\,dx$

$\boxed{\frac{3}{5}\sin x + C}$

20. $\int (1 - 6\cos x)\,dx$

$\boxed{x - 6\sin x + C}$

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

$\boxed{\frac{-1}{x} + \cos x + C}$

22. $\int \left(\sec^2 t + \cos t + 1\right) dt$

$\boxed{\tan t + \sin t + t + C}$

23. $\int \left(\sin^2 x + \cos^2 x\right) dx$

$\boxed{\begin{array}{l}\int 1\,dx \\ x + C\end{array}}$

24. $\int \frac{\sin x}{1 - \sin^2 x}\,dx$

$\boxed{\begin{array}{l}\int \frac{\sin x}{\cos^2 x}\,dx \\ \int \tan x \sec x\,dx \\ \sec x + C\end{array}}$

Solve the following differential equations.

25. $f''(x) = 2, f'(1) = 4, f(2) = -2$

$\boxed{\begin{array}{l} f'(x) = \int 2\,dx \\ f'(x) = 2x + C_1 \\ f'(1) = 2 + C_1 = 4 \\ C_1 = 2 \\ f'(x) = 2x + 2 \end{array}}$

$\boxed{\begin{array}{l} f(x) = \int (2x + 2)\,dx \\ f(x) = x^2 + 2x + C_2 \\ f(2) = 4 + 4 + C_2 = -2 \\ C_2 = -10 \\ f(x) = x^2 + 2x - 10 \end{array}}$

26. $f''(x) = 2x, f'(2) = -1, f(3) = 1$

$\boxed{\begin{array}{l} f'(x) = \int 2x\,dx \\ f'(x) = x^2 + C_1 \\ f'(2) = 4 + C_1 = -1 \\ C_1 = -5 \\ f'(x) = x^2 - 5 \end{array}}$

$\boxed{\begin{array}{l} f(x) = \int (x^2 - 5)\,dx \\ f(x) = \frac{x^3}{3} - 5x + C_2 \\ f(3) = 9 - 15 + C_2 = 1 \\ C_2 = 7 \\ f(x) = \frac{x^3}{3} - 5x + 7 \end{array}}$

27. $f''(x) = \frac{1}{x^{3/2}}, f'(4) = 2, f(0) = 1$

$\boxed{\begin{array}{l} f'(x) = \int x^{\frac{-3}{2}}\,dx \\ f'(x) = -2x^{\frac{-1}{2}} + C_1 \\ f'(2) = -1 + C_1 = 2 \\ C_1 = 3 \\ f'(x) = -2x^{\frac{-1}{2}} + 3 \end{array}}$

$\boxed{\begin{array}{l} f(x) = \int \left(-2x^{\frac{-1}{2}} + 3\right) dx \\ f(x) = -4x^{\frac{1}{2}} + 3x + C_2 \\ f(0) = 0 + C_2 = 1 \\ C_2 = 1 \\ f(x) = -4x^{\frac{1}{2}} + 3x + 1 \end{array}}$

28. $f''(x) = \cos x, f'(\pi) = 2, f(\pi) = -1$

$\boxed{\begin{array}{l} f'(x) = \int \cos x\,dx \\ f'(x) = \sin x + C_1 \\ f'(\pi) = 0 + C_1 = 2 \\ C_1 = 2 \\ f'(x) = \sin x + 2 \end{array}}$

$\boxed{\begin{array}{l} f(x) = \int (\sin x + 2)\,dx \\ f(x) = -\cos x + 2x + C_2 \\ f(\pi) = 1 + 2\pi + C_2 = -1 \\ C_2 = -2 - 2\pi \\ f(x) = -\cos x + 2x - 2 - 2\pi \end{array}}$