

## EXERCISE 12A

### BASIC ANTIDERIVATIVES

Find the following indefinite integrals using the basic rule  $\int x^n dx = \frac{x^{n+1}}{n+1} + c$

1. (a)  $\int x^2 dx$                       (b)  $\int x^7 dx$                       (c)  $\int \sqrt{x} dx$
2. (a)  $\int 6 dx$                       (b)  $\int (-2) dx$                       (c)  $\int \frac{1}{x^3} dx$
3. (a)  $\int 3x^2 dx$                       (b)  $\int 4x dx$                       (c)  $\int (6x^2 + 2x) dx$
4. (a)  $\int 9 - 8x^7 dx$                       (b)  $\int x^{2.1} dx$                       (c)  $\int (x^7 - 6x + 3 + \frac{3}{x^4}) dx$
5. (a)  $\int 4t^5 dt$                       (b)  $\int \frac{1}{4t^5} dt$                       (c)  $\int \pi r^3 dr$
6. (a)  $\int (x+3)(x-4) dx$                       (b)  $\int \frac{-5+x^3}{x^2} dx$                       (c)  $\int (2x+b) dx$
7. (a)  $\int \frac{3}{2} \sqrt{x} dx$                       (b)  $\int 4\sqrt{x} dx$                       (c)  $\int (x^2 - 4\sqrt{x}) dx$

### ANSWERS

1. (a)  $\frac{x^3}{3} + c$                       (b)  $\frac{x^8}{8} + c$                       (c)  $\frac{2}{3} x^{\frac{3}{2}} + c$
2. (a)  $6x + c$                       (b)  $-2x + c$                       (c)  $-\frac{1}{2x^2} + c$
3. (a)  $x^3 + c$                       (b)  $2x^2 + c$                       (c)  $2x^3 + x^2 + c$
4. (a)  $9x - x^8 + c$                       (b)  $\frac{x^{3.1}}{3.1} + c$                       (c)  $\frac{x^8}{8} - 3x^2 + 3x - \frac{1}{x^3} + c$
5. (a)  $\frac{2t^6}{3} + c$                       (b)  $\frac{-1}{16t^4} + c$                       (c)  $\frac{\pi r^4}{4} + c$
6. (a)  $\frac{x^3}{3} - \frac{x^2}{2} - 12x + c$                       (b)  $\frac{5}{x} + \frac{x^2}{2} + c$                       (c)  $x^2 + bx + c$
7. (a)  $x\sqrt{x} + c$                       (b)  $\frac{8x\sqrt{x}}{3} + c$                       (c)  $\frac{x^3}{3} - \frac{8x\sqrt{x}}{3} + c$

## EXERCISE 12B

### FURTHER ANTIDERIVATIVES

Find the following indefinite integrals using the basic rule from the previous exercise

or the rules  $\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{a(n+1)} + c$  or  $\int f'(x)[f(x)]^n dx = \frac{[f(x)]^{n+1}}{n+1} + c$

where applicable.

- |  |   |  |
|--|---|--|
| 1. (a) $\int (2x-1)^3 dx$              | (b) $\int (3x-1)^2 dx$                    | (c) $\int (9-2x)^3 dx$                                   |
| 2. (a) $\int 5(x-2)^4 dx$              | (b) $\int 3(6x-2)^4 dx$                   | (c) $\int \frac{1}{(2x-3)^4} dx$                         |
| 3. (a) $\int \sqrt{x+5} dx$            | (b) $\int \frac{1}{\sqrt{2x+1}} dx$       | (c) $\int \frac{dx}{x^2+4x+4}$                           |
| 4. (a) $\int 2x(x^2-3)^5 dx$           | (b) $\int 3x^2(x^3-5)^2 dx$               | (c) $\int (2x+1)(x^2+x+9)^3 dx$                          |
| 5. (a) $\int x^2(2x^3+1)dx$            | (b) $\int x(9-x^2)^5 dx$                  | (c) $\int \frac{1}{x^2} \left(1-\frac{1}{x}\right)^7 dx$ |
| 6. $\int (x-1)^{243} dx$               | 7. $\int \sqrt{1-x} dx$                   | 8. $\int \frac{1}{\sqrt{1-x}} dx$                        |
| 9. $\int (x+1)(x^2+2x)^6 dx$           | 10. $\int x\sqrt{2x^2-1} dx$              | 11. $\int (3x-1)^5 dx$                                   |
| 12. $\int (2-t)^{\frac{2}{3}} dt$      | 13. $\int x^2\sqrt{1+x^3} dx$             | 14. $\int (1+x^3)^2 dx$                                  |
| 15. $\int \frac{3x^2}{(x^3+7)^4} dx$   | 16. $\int x(x^2+1)^{10} dx$               | 17. $\int \frac{dt}{2\sqrt{1+t}}$                        |
| 18. $\int \frac{x^2}{\sqrt{1+x^3}} dx$ | 19. $\int \sqrt{2+5y} dy$                 | 20. $\int \frac{dx}{(3x+2)^2}$                           |
| 21. $\int 5r\sqrt{1-r^2} dr$           | 22. $\int \frac{3r dr}{\sqrt{1-r^2}}$     | 23. $\int \frac{y dy}{\sqrt{2y^2+1}}$                    |
| 24. $\int x^4(7-x^5)^3 dx$             | 25. $\int \frac{x^3 dx}{\sqrt[4]{1+x^4}}$ | 26. $\int \frac{ds}{(s+1)^3}$                            |
| 27. $\int \frac{s ds}{(s^2+1)^2}$      | 28. $\int \frac{dy}{y^2-2y+1}$            | 29. $\int \frac{(x+1) dx}{2\sqrt{x+1}}$                  |

ANSWERS (constants of integration omitted)

- |     |                                      |  |  |
|-----|--------------------------------------|--|--|
| 1.  | (a) $\frac{(2x-1)^4}{8}$             | (b) $\frac{(3x-1)^3}{9}$               | (c) $\frac{-(9-2x)^4}{8}$                |
| 2.  | (a) $(x-2)^5$                        | (b) $\frac{(6x-2)^5}{10}$              | (c) $\frac{-1}{6(2x-3)^3}$               |
| 3.  | (a) $\frac{2}{3}(x+5)^{\frac{3}{2}}$ | (b) $\sqrt{2x+1}$                      | (c) $\frac{-1}{x+2}$                     |
| 4.  | (a) $\frac{1}{6}(x^2-3)^6$           | (b) $\frac{1}{3}(x^3-5)^3$             | (c) $\frac{(x^2+x+9)^4}{4}$              |
| 5.  | (a) $\frac{1}{12}(2x^3+1)^2$         | (b) $-\frac{1}{12}(9-x^2)^6$           | (c) $\frac{1}{8}(1-\frac{1}{x})^8$       |
| 6.  | $\frac{(x-1)^{244}}{244}$            | 7. $-\frac{2}{3}(1-x)^{\frac{3}{2}}$   | 8. $-2(1-x)^{\frac{1}{2}}$               |
| 9.  | $\frac{1}{14}(x^2+2x)^7$             | 10. $\frac{(2x^2-1)^{\frac{3}{2}}}{6}$ | 11. $\frac{(3x-1)^6}{18}$                |
| 12. | $\frac{-3}{5}(2-t)^{\frac{5}{3}}$    | 13. $\frac{2}{9}(1+x^3)^{\frac{3}{2}}$ | 14. $x + \frac{x^4}{2} + \frac{x^7}{7}$  |
| 15. | $-\frac{1}{3(x^3+7)^3}$              | 16. $\frac{(x^2+1)^{11}}{22}$          | 17. $\sqrt{1+t}$                         |
| 18. | $\frac{2}{3}\sqrt{1+x^3}$            | 19. $\frac{2(2+5y)^{\frac{3}{2}}}{15}$ | 20. $\frac{-(3x+2)^{-1}}{3}$             |
| 21. | $\frac{-5}{3}(1-r^2)^{\frac{3}{2}}$  | 22. $-3(1-r^2)^{\frac{1}{2}}$          | 23. $\frac{1}{2}(2y^2+1)^{\frac{1}{2}}$  |
| 24. | $\frac{-(7-x^5)^4}{20}$              | 25. $\frac{1}{3}(1+x^4)^{\frac{3}{4}}$ | 26. $\frac{-(s+1)^{-2}}{2}$              |
| 27. | $\frac{-(s^2+1)^{-1}}{2}$            | 28. $-(y-1)^{-1}$                      | 29. $\frac{1}{3}(x+1)^{\frac{3}{2}} + c$ |