

**Fun with Integration!**

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

2.  $\int \sqrt{x} dx = \frac{2}{3}x^{3/2} + C$

3.  $\int (2x)^5 dx = \frac{16}{3}x^6 + C$

4.  $\int (x + 3)^2 dx = \frac{1}{3}(x + 3)^3 + C$  or:  $\frac{1}{3}x^3 + 3x^2 + 9x + C$

5.  $\int x^n dx$ , with  $n$  positive.  $= \frac{1}{n+1}x^{n+1} + C$

6.  $\int \frac{1}{w^2} dw = -\frac{1}{w} + C$

7.  $\int (w^7 + \frac{1}{w^3} + 2e^w) dw = \frac{1}{8}w^8 - \frac{1}{2w^2} + C$

8.  $\int \frac{1}{w^m} dw$ , with  $m$  positive and bigger than 1.  $= -\frac{1}{m-1} \frac{1}{w^{m-1}} + C$

9.  $\int \frac{1}{z} dz = \ln(z) + C$

10.  $\int \frac{3}{z} dz = 3 \ln(z) + C$

11.  $\int 5^z dz = \left(\frac{1}{\ln 5}\right)5^z + C$

12.  $\int \ln(5^z) dz = \left(\frac{\ln 5}{2}\right)z^2 + C$

13.  $\int e^z dz = e^z + C$

$$14. \int a^z dz, \text{ with } a \text{ positive.} = \left(\frac{1}{\ln a}\right)a^z + C$$

$$15. \int \cos(t) dt = \sin(t) + C$$

$$16. \int \cos(2t) dt = \frac{1}{2} \sin(2t) + C$$

$$17. \int \sec^2 t dt = \tan(t) + C$$

$$18. \int \frac{1}{1+t^2} dt = \arctan(t) + C$$

$$19. \int \frac{1}{\sqrt{1-t^2}} dt = \arcsin(t) + C$$

### Extra Fun

$$20. \int \frac{1}{Cabin} d(Cabin) = \ln(Cabin) + C = \text{natural log cabin} + C = \text{houseboat}$$

$$21. \int 2xe^{x^2} dx = e^{x^2} + C$$

$$22. \int e^x e^{e^x} dx = e^{e^x} + C$$

$$23. \int \cot x dx = \ln(\sin x) + C$$

$$24. \int (\ln x + 1) dx = x \ln x + C$$

$$25. \int \cosh x dx = \sinh x + C$$

$$26. \int \cosh(\ln x) dx = \frac{1}{4}x^2 + \frac{1}{2} \ln x + C$$