

## Table of Formulae

### Geometric Formulae

Circle radius  $r$ : circumference =  $2\pi r$ , area =  $\pi r^2$

Triangle height  $h$ , base  $b$ : area =  $\frac{1}{2}bh$

Right circular cylinder height  $h$  cross-sectional radius  $r$ : curved surface area =  $2\pi rh$ , volume =  $\pi r^2 h$

Sphere radius  $r$ : surface area =  $4\pi r^2$ , volume =  $\frac{4}{3}\pi r^3$

### Trigonometric Identities

1)  $\sin^2(x) + \cos^2(x) = 1$ ,  $1 + \tan^2(x) = \sec^2(x)$ ,  $\cot^2(x) + 1 = \csc^2(x)$

2)  $\cos(2x) = \cos^2(x) - \sin^2(x)$ ,  $\sin(2x) = 2 \sin(x) \cos(x)$

3)  $\sin(A) \cos(B) = \frac{1}{2}(\sin(A-B) + \sin(A+B))$ ,  $\sin(A) \sin(B) = \frac{1}{2}(\cos(A-B) - \cos(A+B))$ ,

$\cos(A) \cos(B) = \frac{1}{2}(\cos(A-B) + \cos(A+B))$

### Error bounds in Numerical Integration Methods

Midpoint Rule:  $|E_M| \leq \frac{K(b-a)^3}{24n^2}$ , where  $|f''(x)| \leq K$  for  $a \leq x \leq b$

Trapezoidal Rule:  $|E_T| \leq \frac{K(b-a)^3}{12n^2}$ , where  $|f''(x)| \leq K$  for  $a \leq x \leq b$

Simpson's Rule:  $|E_S| \leq \frac{K(b-a)^5}{180n^4}$ , where  $|f^{(4)}(x)| \leq K$  for  $a \leq x \leq b$

**Newton's Method**  $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$

### Integrals

1)  $\int x^n dx = \frac{x^{n+1}}{n+1} + C$  for  $n \neq -1$

2)  $\int \frac{1}{x} dx = \ln(|x|) + C$

3)  $\int e^x dx = e^x + C$

4)  $\int a^x dx = \frac{1}{\ln(a)} a^x + C$

5)  $\int \sin(x) dx = -\cos(x) + C$

6)  $\int \cos(x) dx = \sin(x) + C$

7)  $\int \sec^2(x) dx = \tan(x) + C$

8)  $\int \csc^2(x) dx = -\cot(x) + C$

9)  $\int \sec(x) \tan(x) dx = \sec(x) + C$

10)  $\int \csc(x) \cot(x) dx = -\csc(x) + C$

11)  $\int \sec(x) dx = \ln(|\sec(x) + \tan(x)|) + C$

12)  $\int \csc(x) dx = \ln(|\csc(x) - \cot(x)|) + C$

13)  $\int \tan(x) dx = \ln(|\sec(x)|) + C$

14)  $\int \cot(x) dx = \ln(|\sin(x)|) + C$

15)  $\int \frac{1}{x^2 + a^2} dx = \frac{1}{a} \arctan\left(\frac{x}{a}\right) + C$

16)  $\int \frac{1}{\sqrt{a^2 - x^2}} dx = \arcsin\left(\frac{x}{a}\right) + C$