

Test tex!

NUAA

January 2021

## Introduction

1. Let's begin with a formula  $e^{i\pi} + 1 = 0$

$$e = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = \lim_{n \rightarrow \infty} \frac{n}{\sqrt[n]{n!}}$$

2. we can do another:

$$e = \sum_{n=0}^{\infty} \frac{1}{n}.$$

3. we can also use continued fractions:

$$e = 2 + \frac{1}{1 + \frac{2}{2 + \frac{3}{3 + \frac{4}{4 + \frac{5}{5 + \ddots}}}}}$$

## More formulas

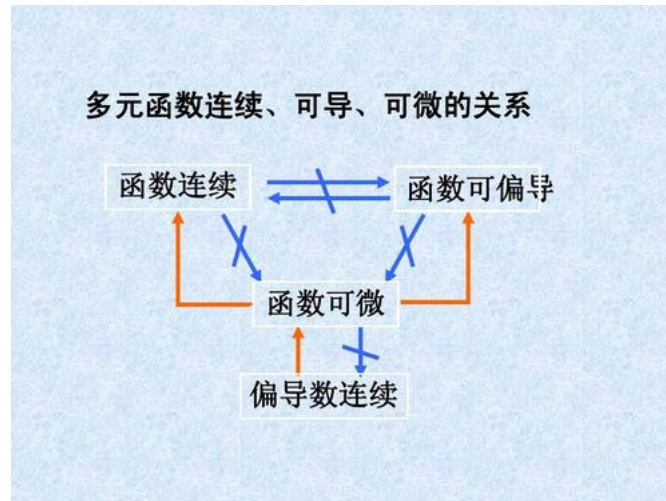
$$\int_a^b f(x) dx$$

$$\iiint f(x, y, z) dx dy dz$$

$$\vec{v} = \langle v_1, v_2, v_3 \rangle$$

$$\vec{v} \cdot \vec{w}$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$



**1.1** *A* find the sum of 34 and 126 using a calculator.

$$34 + 126 = \boxed{160}$$

*B* Find the sum using long addition.

$$\begin{array}{r} 10 \\ 34 \\ + 126 \\ \hline 160 \end{array}$$

**1.2** Evaluate the following definite integral:

$$\begin{aligned} & \int_0^3 2x\sqrt{x^2+4}dx \\ & u = x^2 + 4 \quad du = 2x \\ \Rightarrow & \int_{0^2+4}^{3^2+4} \sqrt{u}du = \frac{1}{2}u^{-\frac{1}{2}} \Big|_4^{13} \\ & \frac{1}{2\sqrt{13}} - \frac{1}{2\sqrt{4}} \approx \boxed{-0.1113} \end{aligned}$$

**2.1** *A* Find the root of the quadratic equation  $y = x^2 + 2x - 3$  using the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## 1 Weighted Residual Methods

**Fundamental equations** Consider the problem governed by the differential equation:

$$\Gamma u = -\bar{f} \quad \text{in } D$$

The above differential equation is solved by using the boundary conditions given as follows:

$$u = -\bar{u} \quad \text{on } S_u$$

$$t \equiv Bu = \bar{t} \quad \text{on } S \setminus S_t$$

where the boundary  $S$  consists of  $S_t$  and  $S_u$ . The boundary conditions given in eqs. (84) and (85) are called rigid and natural boundary conditions, or Dirichlet and Neumann boundary conditions, respectively. In most engineering problems,  $\Gamma$  and  $\mathbf{B}$  are different operators in the forms of  $\Gamma = \Delta \cdot \Sigma$  and  $\mathbf{B} = \mathbf{n} \cdot \Sigma$ , where  $\varsigma$  is another differential operators and  $\mathbf{n}$  is the normal vector on  $S_t$ .

$$\Delta^2 u = -\bar{f} \quad \text{in } D,$$