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1.

$$1 \quad p_i \geq 0, \quad i = 1, 2, \dots$$

$$2 \quad p_1 + p_2 + \dots = 1$$

2.

$$C_n^k p^k q^{n-k} = b(k; n, p)$$

3.

$$E\xi = x_1 p_1 + x_2 p_2 + \dots + x_n p_n + \dots$$

$$E(a\xi + b) = aE\xi + b$$

$$\xi \sim B(n, p) \quad E\xi = np$$

4.

$$D\xi = (x_1 - E\xi)^2 \cdot p_1 + (x_2 - E\xi)^2 \cdot p_2 + \dots + (x_n - E\xi)^2 \cdot p_n + \dots$$

5.

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-u)^2}{2\sigma^2}}, \quad x \in (-\infty, +\infty)$$

$$u, \quad \sigma (\sigma > 0)$$

$$N(u, \sigma^2)$$

$$\sigma = 1, \quad u = 0 \quad f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}, \quad x \in (-\infty, +\infty)$$

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$$\lim_{x \rightarrow \infty} c = c \quad \mathbf{C}$$

$$\lim_{x \rightarrow x_0} f(x) = a \Leftrightarrow \lim_{x \rightarrow x_0^-} f(x) = \lim_{x \rightarrow x_0^+} f(x) = a$$

$$\lim_{x \rightarrow x_0} f(x) = a, \quad \lim_{x \rightarrow x_0} g(x) = b$$

$$\lim_{x \rightarrow x_0} [f(x) \pm g(x)] = a \pm b$$

$$\lim_{x \rightarrow x_0} [f(x) \cdot g(x)] = a \cdot b$$

$$\lim_{x \rightarrow x_0} \frac{f(x)}{g(x)} = \frac{a}{b} \quad (b \neq 0)$$

$$\lim_{n \rightarrow \infty} a_n = a, \quad \lim_{n \rightarrow \infty} b_n = b$$

$$\lim_{n \rightarrow \infty} (a_n \pm b_n) = a \pm b$$

$$\lim_{n \rightarrow \infty} (a_n \cdot b_n) = a \cdot b$$

$$\lim_{n \rightarrow \infty} \frac{a_n}{b_n} = \frac{a}{b} \quad (b \neq 0)$$

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$$c' = 0_{\mathbf{C}}$$

$$(x^n)' = nx^{n-1} \quad (n \in \mathcal{Q})$$

$$(\sin x)' = \cos x$$

$$(\cos x)' = -\sin x$$

$$(\ln x)' = \frac{1}{x}$$

$$(\log_a x)' = \frac{1}{x} \log_a e$$

$$(e^x)' = e^x$$

$$(a^x)' = a^x \ln a$$

$$(u \pm v)' = u' \pm v'$$

$$(uv)' = u'v + uv'$$

$$\left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2} \quad (v \neq 0)$$

$$y_x' = y_u' \cdot u_x'$$

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1.

$$A \subseteq B, B \subseteq A \Leftrightarrow A = B$$

$$A \cap B = \{x | x \in A, \text{ 且 } x \in B\}$$

$$A \cup B = \{x | x \in A \text{ 或 } x \in B\}$$

$$\bar{A}_U = \{x | x \in U, \text{ 且 } x \notin A\}$$

$$\text{card}(A \cup B) = \text{card}(A) + \text{card}(B) - \text{card}(A \cap B)$$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m} \quad (a > 0, m, n \in \mathbb{N}, \text{ 且 } n > 1)$$

$$a^{-\frac{m}{n}} = \frac{1}{a^{\frac{m}{n}}} = \frac{1}{\sqrt[n]{a^m}} \quad (a > 0, m, n \in \mathbb{N}, \text{ 且 } n > 1)$$

$$a^{\log_a N} = N, \quad \log_a N = \frac{\log_b N}{\log_b a}$$

$$\log_a(MN) = \log_a M + \log_a N$$

$$\log_a\left(\frac{M}{N}\right) = \log_a M - \log_a N$$

$$\log_a M^n = n \log_a M \quad (n \in \mathbb{R})$$

$$\log_b N = \frac{\log_a N}{\log_a b}$$

$$a^{f(x)} = b \Leftrightarrow f(x) = \log_a b \quad (a > 0, a \neq 1, b > 0)$$

$$\log_a f(x) = b \Leftrightarrow f(x) = a^b \quad (a > 0, a \neq 1)$$

$$a^{f(x)} = a^{g(x)} \Leftrightarrow f(x) = g(x) \quad (a > 0, a \neq 1)$$

$$\log_a f(x) = \log_a g(x) \Leftrightarrow f(x) = g(x) > 0 \quad (a > 0, a \neq 1)$$

$$f(a^x) = 0 \Leftrightarrow f(\log_a x) = 0$$

2.

1

$$a_{n+1} - a_n = d$$

$$a_n = a_1 + (n-1)d$$

$$a, A, b \text{ 成等差} \Rightarrow 2A = a + b$$

$$m+n = k+l \Rightarrow a_m + a_n = a_k + a_l$$

$$S_n = \frac{(a_1 + a_n)n}{2} = na_1 + \frac{1}{2}n(n-1)d$$

2

$$a_n = a_1 q^{n-1}$$

$$a, G, b \text{ 成等比} \Rightarrow G^2 = ab$$

$$m+n = k+l \Rightarrow a_m a_n = a_k a_l$$

$$S_n = \begin{cases} \frac{a_1(1-q^n)}{1-q} & (q \neq 1) \\ na_1 & (q = 1) \end{cases}$$

3

$$\sum_{k=1}^n k = \frac{n(n+1)}{2}$$

$$\sum_{k=1}^n k^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{k=1}^n k^3 = \left[\frac{n(n+1)}{2} \right]^2$$

3.

$$a > b \Leftrightarrow b < a$$

$$a > b, b > c \Rightarrow a > c$$

$$a > b \Rightarrow a + c > b + c$$

$$a + b > c \Rightarrow a > c - b$$

$$a > b, c > d \Rightarrow a + c > b + d$$

$$a > b, c > 0 \Rightarrow ac > bc$$

$$a > b, c < 0 \Rightarrow ac < bc$$

$$a > b > 0, c > d > 0 \Rightarrow ac < bd$$

$$a > b > 0 \Rightarrow a^n > b^n \quad (n \in \mathbb{Z}, n > 1)$$

$$a > b > 0 \Rightarrow \sqrt[n]{a} > \sqrt[n]{b} \quad (n \in \mathbb{Z}, n > 1)$$

$$(a - b)^2 \geq 0$$

$$a, b \in \mathbb{R} \Rightarrow a^2 + b^2 \geq 2ab$$

$$a, b \in \mathbb{R}^+ \Rightarrow \frac{a+b}{2} \geq \sqrt{ab}$$

$$a, b, c \in \mathbb{R}^+ \Rightarrow a^3 + b^3 + c^3 \geq 3abc$$

$$a, b, c \in \mathbb{R}^+ \Rightarrow \frac{a+b+c}{3} \geq \sqrt[3]{abc}$$

$$|a| - |b| \leq |a \pm b| \leq |a| + |b|$$

4.

$$a + bi = c + di \Leftrightarrow a = c, \quad b = d$$

$$|a + bi| = \sqrt{a^2 + b^2}$$

$$(a + bi) + (c + di) = (a + c) + (b + d)i$$

$$(a + bi) - (c + di) = (a - c) + (b - d)i$$

$$(a + bi)(c + di) = (ac - bd) + (bc + ad)i$$

$$\frac{a + bi}{c + di} = \frac{ac + bd}{c^2 + d^2} + \frac{bc - ad}{c^2 + d^2}i$$

$$(a + bi)^n = a^n + C_n^1 a^{n-1}(bi) + \cdots + C_n^n (bi)^n$$

$$a + bi = r(\cos \theta + i \sin \theta)$$

$$r_1(\cos \theta_1 + i \sin \theta_1) \cdot r_2(\cos \theta_2 + i \sin \theta_2)$$

$$= r_1 \cdot r_2 [\cos(\theta_1 + \theta_2) + i \sin(\theta_1 + \theta_2)]$$

$$[r(\cos \theta + i \sin \theta)]^n$$

$$= r^n (\cos n\theta + i \sin n\theta) \frac{r_1(\cos \theta_1 + i \sin \theta_1)}{r_2(\cos \theta_2 + i \sin \theta_2)}$$

$$= \frac{r_1}{r_2} [\cos(\theta_1 - \theta_2) + i \sin(\theta_1 - \theta_2)]$$

$$\omega_k = \sqrt[n]{r} \left(\cos \frac{2k\pi + \theta}{n} + i \sin \frac{2k\pi + \theta}{n} \right)$$

$$k = 0, 1, \dots, n-1$$

$$|z_1 z_2| = |z_1| \cdot |z_2|$$

$$\frac{|z_1|}{|z_2|} = \frac{|z_1|}{|z_2|}$$

$$|z^n| = |z|^n$$

$$\left| |z_1| - |z_2| \right| \leq |z_1 \pm z_2| \leq |z_1| + |z_2|$$

$$|z|^2 = |\bar{z}|^2 = z\bar{z}$$

$$\overline{z_1 \pm z_2} = \bar{z}_1 \pm \bar{z}_2$$

$$\overline{z_1 \cdot z_2} = \bar{z}_1 \cdot \bar{z}_2$$

$$\overline{\left(\frac{z_1}{z_2} \right)} = \frac{\bar{z}_1}{\bar{z}_2}$$

5.

$$A_n^m = n(n-1)(n-2)\cdots(n-m+1)$$

$$A_n^m = \frac{n!}{(n-m)!}$$

$$C_n^m = \frac{A_n^m}{m!} = \frac{n(n-1)\cdots(n-m+1)}{m!}$$

$$C_n^m = \frac{n!}{m!(n-m)!}$$

$$C_{n+1}^m = C_n^m + C_n^{m-1}$$

$$C_n^m = C_n^{n-m}$$

$$(a+b)^n = C_n^0 a^n + C_n^1 a^{n-1} b + \cdots + C_n^r a^{n-r} b^r + \cdots + C_n^n b^n$$

$$T_{r+1} = C_n^r a^{n-r} b^r$$

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1.

$$\sin^2 \alpha + \cos^2 \alpha = 1$$

$$1 + \tan^2 \alpha = \sec^2 \alpha$$

$$1 + \cot^2 \alpha = \csc^2 \alpha$$

$$\sin \alpha \csc \alpha = 1, \quad \tan \alpha = \frac{\sin \alpha}{\cos \alpha}$$

$$\cos \alpha \sec \alpha = 1, \quad \cot \alpha = \frac{\cos \alpha}{\sin \alpha}$$

$$\tan \alpha \cot \alpha = 1$$

2.

$$\sin(k \cdot 360^\circ + \alpha) = \sin \alpha$$

$$\cos(k \cdot 360^\circ + \alpha) = \cos \alpha$$

$$\tan(k \cdot 360^\circ + \alpha) = \tan \alpha$$

$$\cos(-\alpha) = \cos \alpha$$

$$\sin(-\alpha) = -\sin \alpha$$

$$\tan(-\alpha) = -\tan \alpha$$

$$\sin(180^\circ \pm \alpha) = \pm \sin \alpha$$

$$\cos(180^\circ \pm \alpha) = -\cos \alpha$$

$$\tan(180^\circ \pm \alpha) = \pm \tan \alpha$$

$$\sin(360^\circ - \alpha) = -\sin \alpha$$

$$\cos(360^\circ - \alpha) = \cos \alpha$$

$$\tan(360^\circ - \alpha) = -\tan \alpha$$

$$\sin(90^\circ \pm \alpha) = \pm \cos \alpha$$

$$\cos(90^\circ \pm \alpha) = \mp \sin \alpha$$

$$\tan(90^\circ \pm \alpha) = \mp \cot \alpha$$

$$\sin(270^\circ \pm \alpha) = \mp \cos \alpha$$

$$\cos(270^\circ \pm \alpha) = \pm \sin \alpha$$

$$\tan(270^\circ \pm \alpha) = \pm \cot \alpha$$

3.

$$\sin(\alpha \pm \beta) = \sin \alpha \cos \beta \pm \cos \alpha \sin \beta$$

$$\cos(\alpha \pm \beta) = \cos \alpha \cos \beta \mp \sin \alpha \sin \beta$$

$$\tan(\alpha \pm \beta) = \frac{\tan \alpha \pm \tan \beta}{1 \mp \tan \alpha \tan \beta}$$

4.

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha = 2 \cos^2 \alpha - 1 = 1 - 2 \sin^2 \alpha$$

$$\tan 2\alpha = \frac{2 \tan \alpha}{1 - \tan^2 \alpha}$$

5.

$$\sin \frac{\alpha}{2} = \pm \sqrt{\frac{1 - \cos \alpha}{2}}$$

$$\cos \frac{\alpha}{2} = \pm \sqrt{\frac{1 + \cos \alpha}{2}}$$

$$\tan \frac{\alpha}{2} = \pm \sqrt{\frac{1 - \cos \alpha}{1 + \cos \alpha}}$$

$$\tan \frac{\theta}{2} = \frac{1 - \cos \theta}{\sin \theta} = \frac{\sin \theta}{1 + \cos \theta}$$

6.

$$\sin \alpha = \frac{2 \tan \frac{\alpha}{2}}{1 + \tan^2 \frac{\alpha}{2}}, \quad \cos \alpha = \frac{1 - \tan^2 \frac{\alpha}{2}}{1 + \tan^2 \frac{\alpha}{2}}$$

$$\tan \alpha = \frac{2 \tan \frac{\alpha}{2}}{1 - \tan^2 \frac{\alpha}{2}}$$

$$a \sin \alpha + b \cos \alpha = \sqrt{a^2 + b^2} \sin(\alpha + \varphi)$$

7.

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

8.

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = c^2 + a^2 - 2ca \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

1.

$$a + 0 = 0 + a$$

$$a + b = b + a$$

$$(a + b) + c = a + (b + c)$$

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2.

$$-(-a) = a$$

$$a + (-a) = (-a) + a = 0$$

$$a - b = a + (-b)$$

3. λ, u a, b

$$|\lambda a| = |\lambda| |a|$$

$$\lambda(ua) = (\lambda u)a$$

$$(\lambda + u)a = \lambda a + ua$$

$$\lambda(a + b) = \lambda a + \lambda b$$

$$\overrightarrow{P_1 P} = \lambda \overrightarrow{P_1 P_2} \quad P_1, P, P_2 (x_1, y_1) (x, y) (x_2, y_2)$$

$$x = \frac{x_1 + \lambda x_2}{1 + \lambda}$$

$$y = \frac{y_1 + \lambda y_2}{1 + \lambda}$$

$$a \cdot b = |a| |b| \cos \theta$$

$$ba^{|b| \cos \theta}$$

$$abeb \quad \theta ae$$

$$1 \quad e \cdot a = a \cdot e = |a| \cos \theta$$

$$2 \quad a \perp b \Leftrightarrow a \cdot b = 0$$

$$3ab \quad a \cdot b = |a| |b|$$

$$ab \quad a \cdot b = -|a| |b|$$

$$a \cdot a = a^2 = |a|^2$$

$$|a| = \sqrt{a \cdot a}$$

$$4 \quad \cos \theta = \frac{a \cdot b}{|a| |b|}$$

$$5 \quad |a \cdot b| \leq |a| |b|$$

abc λ

$$a \cdot b = b \cdot a$$

$$(\lambda a) \cdot b = \lambda(a \cdot b) = a \cdot (\lambda b)$$

$$(a + b) \cdot c = a \cdot c + b \cdot c$$

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1.

$$y - y_1 = k(x - x_1)$$

$$y = kx + b$$

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$$

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$Ax + By + C = 0$$

2.

$$|AB| = |x_B - x_A|$$

$$|P_1P_2| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\begin{cases} x = \frac{x_1 + \lambda x_2}{1 + \lambda} \\ y = \frac{y_1 + \lambda y_2}{1 + \lambda} \end{cases}$$

$$\begin{cases} x = \frac{x_1 + x_2}{2} \\ y = \frac{y_1 + y_2}{2} \end{cases}$$

3.

$$l_1 // l_2 \Leftrightarrow \frac{A_1}{A_2} = \frac{B_1}{B_2} \neq \frac{C_1}{C_2}$$

$$k_1 = k_2 \quad b_1 \neq b_2$$

$$l_1 \perp l_2 \Leftrightarrow \frac{A_1}{A_2} = \frac{B_1}{B_2} = \frac{C_1}{C_2}$$

$$k_1 = k_2 \quad b_1 = b_2$$

$$l_1 \perp l_2 \Leftrightarrow \frac{A_1}{A_2} \neq \frac{B_1}{B_2}$$

$$k_1 \neq k_2$$

$$l_1 \perp l_2 \Leftrightarrow A_1 A_2 + B_1 B_2 = 0$$

$$k_1 k_2 = -1$$

$$l_1 \perp l_2$$

$$\tan \theta = \frac{k_2 - k_1}{1 + k_1 k_2} \quad (1 + k_1 k_2 \neq 0)$$

$$l_1 \perp l_2$$

$$\tan \theta = \left| \frac{k_2 - k_1}{1 + k_1 k_2} \right| \quad (1 + k_1 k_2 \neq 0)$$

$$d = \frac{|Ax_0 + By_0 + C|}{\sqrt{A^2 + B^2}}$$

4.

1

$$(x-a)^2 + (y-b)^2 = R^2$$

$$(a, b) \in \mathbf{R}$$

2

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \quad (a > b > 0)$$

$$F_1(-c, 0), F_2(c, 0)$$

$$(b^2 = a^2 - c^2)$$

$$e = \frac{c}{a}$$

$$x = \pm \frac{a^2}{c}$$

$$|MF_1| = a + ex_0, \quad |MF_2| = a - ex_0$$

3

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

4

$$y^2 = 2px \quad (p > 0)$$

$$F\left(\frac{p}{2}, 0\right)$$

$$x = -\frac{p}{2}$$

1.

$$1 \quad a \parallel b, b \parallel c \Rightarrow a \parallel c$$

$$2 \quad \left. \begin{array}{l} a \perp \alpha \\ b \perp \alpha \end{array} \right\} \Rightarrow a \parallel b$$

$$3 \quad \left. \begin{array}{l} a \parallel \alpha \\ \alpha \subset \beta \\ \alpha \perp \beta = b \end{array} \right\} \Rightarrow a \parallel b$$

$$4 \quad \left. \begin{array}{l} a \parallel \beta \\ \gamma \perp \alpha = a \\ \gamma \perp \beta = b \end{array} \right\} \Rightarrow a \parallel b$$

2.

$$1 \quad \left. \begin{array}{l} a \perp \alpha \\ b \subset \alpha \end{array} \right\} \Rightarrow a \perp b$$

$$2 \quad \left. \begin{array}{l} a // b \\ l \perp \alpha \end{array} \right\} \Rightarrow l \perp b$$

3.

1

$$\left. \begin{array}{l} a \notin \alpha \\ b \subset \alpha \\ a \parallel b \end{array} \right\} \Rightarrow a \parallel \alpha$$

$$\left. \begin{array}{l} \alpha \parallel \beta \\ a \subset \alpha \end{array} \right\} \Rightarrow a \parallel \beta$$

2

$$\left. \begin{array}{l} a \parallel \beta \\ a \subset \alpha \\ \alpha \perp \beta = b \end{array} \right\} \Rightarrow a \parallel b$$

...

4.

1

$$\left. \begin{array}{l} m \subset \alpha, n \subset \alpha, m \perp n = B \\ l \perp m, l \perp n \end{array} \right\} \Rightarrow l \perp \alpha$$

$$\left. \begin{array}{l} a \perp b \\ a \perp \alpha \end{array} \right\} \Rightarrow b \perp \alpha$$

2

$$\left. \begin{array}{l} a \perp \alpha \\ b \perp \alpha \end{array} \right\} \Rightarrow a \perp b$$

5.

1

$$\left. \begin{array}{l} a, b \subset \beta \\ \langle 1 \rangle a \parallel \alpha, b \parallel \alpha \\ a \perp b = A \end{array} \right\} \Rightarrow \alpha \parallel \beta$$

$$\langle 2 \rangle \left. \begin{array}{l} a \perp \alpha \\ a \perp \beta \end{array} \right\} \Rightarrow \alpha \parallel \beta$$

$$\langle 3 \rangle \left. \begin{array}{l} \alpha \parallel \gamma \\ \beta \parallel \gamma \end{array} \right\} \Rightarrow \alpha \parallel \beta$$

2

$$\left. \begin{array}{l} \alpha \parallel \beta \\ \langle 1 \rangle \gamma \perp \alpha = a \\ \gamma \perp \beta = b \end{array} \right\} \Rightarrow a \parallel b$$

$$\langle 2 \rangle \left. \begin{array}{l} \alpha \parallel \beta \\ a \subset \alpha \end{array} \right\} \Rightarrow \alpha \parallel \beta$$

...

6.

1

$$\langle 1 \rangle \left. \begin{array}{l} a \subset \alpha \\ a \perp \beta \end{array} \right\} \Rightarrow \alpha \perp \beta$$

$$\langle 2 \rangle \theta = 90^\circ$$

2

$$\langle 1 \rangle \left. \begin{array}{l} \alpha \perp \beta, \alpha \perp \beta = b \\ a \in \alpha, a \perp b \end{array} \right\} \Rightarrow a \perp \beta$$

$$\langle 2 \rangle \left. \begin{array}{l} A \in a, A \in \alpha \\ \alpha \perp \beta \\ a \perp \beta \end{array} \right\} \Rightarrow a \subset \alpha$$

7.

$$S_{\text{正棱柱侧}} = Ch$$

$$S_{\text{正棱锥侧}} = \frac{1}{2}Ch'$$

$$S_{\text{圆柱侧}} = 2\pi Rh$$

$$S_{\text{圆锥侧}} = \pi Rl$$

$$S_{\text{球}} = 4\pi R^2$$

8.

$$V_{\text{棱柱}} = Sh$$

$$V_{\text{棱锥}} = \frac{1}{3}Sh$$

$$V_{\text{圆柱}} = \pi R^2 h$$

$$V_{\text{圆锥}} = \frac{1}{3}\pi R^2 h$$

$$V_{\text{球}} = \frac{4}{3}\pi R^3$$

1.

$$dy = f'(x)dx \quad y = f(x)$$

$$d(u \pm v) = du \pm dv$$

$$d(uv) = u dv + v du$$

$$d\left(\frac{u}{v}\right) = \frac{v du - u dv}{v^2} \quad (v \neq 0)$$

2.

$$\int 0 dx = c$$

$$\int x^m dx = \frac{1}{m+1} x^{m+1} + c \quad (m \in \mathbb{Q}, m \neq -1)$$

$$\int \frac{1}{x} dx = \ln|x| + c$$

$$\int e^x dx = e^x + c$$

$$\int a^x dx = \frac{a^x}{\ln a} + c \quad (a > 0, a \neq 1)$$

$$\int \cos x dx = \sin x + c$$

$$\int \sin x dx = -\cos x + c$$

$$\int kf(x) dx = k \int f(x) dx \quad (k \neq 0)$$

$$\int [f(x) + g(x)] dx = \int f(x) dx + \int g(x) dx$$

3.

$$\int_a^b kf(x)dx = k \int_a^b f(x)dx$$

$$\int_a^b [f(x) \pm g(x)]dx = \int_a^b f(x)dx \pm \int_a^b g(x)dx$$

$$\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx \quad a < c < b$$

$$f(x) [a, b] \quad F(x) f(x) [a, b] \quad F'(x) = f(x)$$

$$\int_a^b f(x)dx = F(b) - F(a)$$