Formeln S10 S19

From the provided context, here are the mathematical formulas extracted along with their titles or explanations where available:

1.2.2 Historical Method for Calculating Integrals

- **Equation (1.4)**:

$$\delta x := \frac{x_E - x_0}{N}$$

- **Equation (1.5)**:

$$x_k := x_0 + k \cdot \delta x \quad \text{for } k \in \{1, \ldots, N\}$$

- **Equation (1.6)**:

$$\delta A_k := f(x_k) \cdot \delta x$$

- **Equation (1.7)**:

$$A \approx \sum_{k=1}^{N} \delta A_k = \sum_{k=1}^{N} f(x_k) \cdot \delta x$$

- **Equation (1.8)**:

$$A = \int_{x_0}^{x_E} f(x)\,dx = \lim_{N \to \infty} \sum_{k=1}^{N} f(x_k) \cdot \delta x \approx \sum_{k=1}^{N} f(x_k) \cdot \delta x$$

1.2.3 Concept at the Original Example

- **Equation (1.9)**:

$$\delta A \approx f(x) \cdot \delta x$$

- **Equation (1.10)**:

$$A = \int_{x_0}^{x_E} f(x)\,dx = F(x_E) - F(x_0)$$

1.2.4 Applications

1.2.4.1 Torque of a Uniformly Loaded Beam

- **Equation (1.11)**:

$$\delta M \approx r(x) \cdot \delta F = x \cdot Q \cdot \delta x$$

- **Equation (1.12)**:

$$M = \int_0^L x \cdot Q \, dx = Q \int_0^L x \, dx = \frac{1}{2} \cdot Q \cdot L^2$$

1.2.4.2 Forces on a Dam

- **Equation (1.13)**:

$$\delta F \approx p(z) \cdot \delta A = \rho \cdot g \cdot z \cdot b(z) \cdot \delta z$$

- **Equation (1.14)**:

$$F = \int_{z_0}^{z_E} \rho \cdot g \cdot z \cdot b(z) \, dz = \rho \cdot g \int_{z_0}^{z_E} z \cdot b(z) \, dz$$

1.2.4.3 Mass Moments of Inertia

- **Equation (1.15)**:

$$\frac{\delta m}{m} = \frac{\delta x}{L} \Rightarrow \delta m = \frac{m}{L} \cdot \delta x$$

- **Equation (1.16)**:

$$\delta I \approx r^2(x) \cdot \delta m = x^2 \cdot \frac{m}{L} \cdot \delta x = \frac{m}{L} \cdot x^2 \cdot \delta x$$

- **Equation (1.17)**:

$$I = \int_{-\frac{L}{2}}^{\frac{L}{2}} \frac{m}{L} \cdot x^2 \, dx = \frac{2 \cdot m}{L} \int_0^{\frac{L}{2}} x^2 \, dx = \frac{1}{12} \cdot m \cdot L^2$$

1.2.4.4 Volume of a Body with Variable Cross-Section

- **Equation (1.18)**:

$$\delta V \approx A(x) \cdot \delta x$$

- **Equation (1.19)**:

$$V = \int_{x_0}^{x_E} A(x) \, dx$$

These formulas cover the mathematical content from the provided context for pages 10-19.