

$$z = z(t), \quad \alpha \leq t \leq \beta, \quad z(\alpha) = a, \quad z(\beta) = b$$

$$F(z(t)) = \varphi(t) \quad \varphi: [\alpha, \beta] \rightarrow \mathbb{C}$$

$$\varphi'(t) = F'(z(t)) \cdot z'(t) = f(z(t)) \cdot z'(t) \quad (*)$$

$$\int_a^b f(z) dz = \int_{\alpha}^{\beta} \varphi'(t) dt = \varphi(\beta) - \varphi(\alpha) = F(z(\beta)) - F(z(\alpha)) =$$

$$= F(b) - F(a)$$