

$$1) \int_0^1 \frac{x}{x + \sqrt{1+x^2}} dx$$

$$2) \int_1^{\infty} \frac{x^{\alpha}}{\sqrt{1+x^2}} dx$$

$$\text{Hinweis: } \operatorname{arsinh}' = \frac{1}{\sqrt{1+x^2}}$$

a) $\alpha = 2$, Divergenz oder Konvergenz?

b) Divergenz $\alpha = ?$

c) Konvergenz $\alpha = ?$

$$3) u' - u' - 2u = 4 \sinh(2x) + 4 \cosh(2x)$$

$$4) u' = x(u - u^2) \quad u(0) = \frac{1}{5}$$

$$5) \int \frac{x^4 - 1}{x^3 - x^2 + x - 1} dx$$

$$6) \lim_{x \rightarrow 0} \left(\frac{1}{\sin^2(x)} - \frac{1}{x} \right)$$