$$\int \frac{1}{\sqrt{p^2-1}}\,dp \ = \ ?$$

$$\int \frac{1}{\sqrt{p^2-1}}\,dp = \cosh^{-1}(x)$$

$$p = \cosh(x)$$

$$\frac{d\cosh(x)}{dx} = \sinh(x)$$

$$\sqrt{p^2-1} = \sinh(x)$$

$$\int \frac{1}{\sqrt{p^2-1}}\,dp = \int \frac{1}{\sinh(x)}\sinh(x)dx = x = \cosh^{-1}(p)$$

$$\cosh^{-1}(x) = q = \ln(x \pm \sqrt{x^2-1})$$

$$\cosh(q) = x$$

$$e^q + e^{-q} = 2x$$

$$e^{2q} - 2xe^q + 1 = 0$$

$$e^q = \frac{2x \pm \sqrt{4x^2-4}}{2}$$

$$e^q = x \pm \sqrt{x^2-1}$$

$$q = \ln(x \pm \sqrt{x^2-1})$$