$$\int \frac{dt}{\sqrt{10 - 100t^2}}$$

$$\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1 - x^2}}$$

$$\frac{d}{dx}(\arctan x) = \frac{1}{x^2 + 1}$$

$$\frac{d}{dx}(\operatorname{arcsec} x) = \frac{1}{|x|\sqrt{x^2 - 1}}$$

$$\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1 - x^2}}$$

$$\int \frac{1}{\sqrt{1 - x^2}}\, dx = \arcsin x + C$$

$$\begin{aligned}\int \frac{dt}{\sqrt{10 - 100t^2}} &= \int \frac{dt}{\sqrt{(10)(1 - 10t^2)}} \\ &= \frac{1}{\sqrt{10}} \int \frac{dt}{\sqrt{1 - 10t^2}}\end{aligned}$$

$$\int \frac{dt}{\sqrt{10 - 100t^2}} = \frac{1}{\sqrt{10}} \int \frac{dt}{\sqrt{1 - 10t^2}}$$

Let $x = \sqrt{10}\,t \qquad dx = \sqrt{10}\,dt \qquad dt = \frac{1}{\sqrt{10}} dx$

$$\frac{1}{10} \int \frac{dx}{\sqrt{1 - x^2}} = \frac{1}{10} \arcsin x + C$$

$$= \frac{1}{10} \arcsin(\sqrt{10}\,t) + C$$

$$\frac{d}{dx}(\operatorname{arcsinh} x) = \frac{1}{\sqrt{1 + x^2}}$$

$$\frac{d}{dx}(\text{arcsinh}, x) = \frac{1}{\sqrt{1+x^2}}$$

$$\int \frac{1}{\sqrt{1+x^2}}\, dx = \operatorname{arcsinh} x + C$$

$$\int \frac{1}{\sqrt{1+16t^2}}\ dt$$

$$\int \frac{1}{\sqrt{1+16t^2}}\ dt = \int \frac{1}{\sqrt{1+(4t)^2}}\ dt$$

Let $x = 4t$ so $dx = 4dt$ and $dt = \frac{1}{4}dx$

$$\begin{aligned}
\int \frac{1}{\sqrt{1+16t^2}}\ dt &= \int \frac{1}{\sqrt{1+x^2}}\ \frac{1}{4}\,dx \\
&= \frac{1}{4}\int \frac{1}{\sqrt{1+x^2}}\ dx \\
&= \frac{1}{4}\operatorname{arcsinh} x + C \\
&= \frac{1}{4}\operatorname{arcsinh} 4t\ \ + C
\end{aligned}$$

$$
\begin{aligned}
\int \frac{1}{\sqrt{1+16t^2}}\, dt &= \frac{1}{4} \operatorname{arcsinh} 4t \;\; + C \\
&= \frac{1}{4} \ln\left(4t + \sqrt{16t^2+1}\right) + C
\end{aligned}
$$

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

$$
\begin{aligned}
\int \frac{1+x}{\sqrt{1+x^2}}\ dx &= \int \frac{1}{\sqrt{1+x^2}}\ dx + \int \frac{x}{\sqrt{1+x^2}}\ dx \\
&= \operatorname{arcsinh} x + \frac{1}{2}\int \frac{du}{\sqrt{u}}\ (\text{where } u = 1+x^2) \\
&= \operatorname{arcsinh} x + \frac{1}{2}\int u^{-1/2} du \\
&= \operatorname{arcsinh} x + u^{1/2} + C \\
&= \ln(x+\sqrt{x^2+1}) + \sqrt{1+x^2} + C
\end{aligned}
$$

$$\int \frac{1}{\sqrt{a^2 - x^2}}\ dx = \arcsin \frac{x}{a}\ + C$$

$$\int \frac{1}{\sqrt{a^2 + x^2}}\ dx = \operatorname{arcsinh} \frac{x}{a}\ + C$$

$$\int \frac{1}{|x|\sqrt{x^2 - a^2}}\ dx = \frac{1}{a}\operatorname{arcsec} \frac{x}{a}\ + C$$

$$\int \frac{1}{a^2 + x^2}\ dx = \frac{1}{a}\arctan \frac{x}{a}\ + C$$

$$\int \frac{1}{a^2 - x^2}\ dx = \frac{1}{a}\operatorname{arctanh} \frac{x}{a}\ + C$$

Trigonometric substitution is a method of calculating integrals involving any of the following forms:

$$\sqrt{a^2 - x^2} \qquad \sqrt{a^2 + x^2} \qquad \sqrt{x^2 - a^2}$$

$$\int \frac{1}{x^2+1}\ dx = \int \frac{1}{\left(\sqrt{x^2+1}\right)^2}\ dx$$