Note: arcsecant anti-derivative requires a trigonometric substitution (see sec. 8.4)

Integration by Parts

$\int \operatorname{arcsec}(x)\,dx$ | $u = \operatorname{arcsec} x$, $du = \frac{1}{x\sqrt{x^2-1}}\,dx$

$dv = dx$, $v = x$

$$\underbrace{= x \operatorname{arcsec} x}_{u\cdot v} \underbrace{- \int \frac{1}{\sqrt{x^2-1}}\,dx}_{-\int v\cdot du}$$

Trigonometric Substitution

Pythagorean Identity: $\tan^2\theta + 1 = \sec^2\theta$

$\tan^2\theta = \sec^2\theta - 1 = x^2 - 1$ if $\underline{x = \sec\theta}$

then $\sqrt{x^2-1} = \sqrt{\sec^2\theta - 1} = \sqrt{\tan^2\theta} = \tan\theta$.

$dx/d\theta = \sec\theta\tan\theta$, so $dx = \sec\theta\tan\theta\,d\theta$

$$\int \frac{1}{\sqrt{x^2-1}}\,dx = \int \frac{1}{\tan\theta}\cdot\sec\theta\tan\theta\,d\theta = \int \sec\theta\,d\theta$$

$$\int \frac{1}{\sqrt{x^2-1}}\,dx = \ln|\sec\theta + \tan\theta| + C.$$

[$\tan\theta = \sqrt{x^2-1}$, see above.] [$\sec\theta = x$, as stated.]

$$\int \operatorname{arcsec}(x)\,dx = x\operatorname{arcsec} x - \ln\left|x + \sqrt{x^2-1}\right| + C$$