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Date: 02/11/22	**Time:** 11:53

Evaluate the integral using any appropriate algebraic method or trigonometric identity.

$$\int \frac{dx}{(x+6)\sqrt{x^2+12x+35}}$$

Begin by completing the square in the expression under the radical. To complete the square for $x^2 + 12x + 35$, obtain the expression $x^2 + 12x + 36$.

$$x^2 + 12x + 35 = x^2 + 12x + 36 - 1$$

Now write $x^2 + 12x + 36 - 1$ as the difference of two squares.

$$\begin{aligned} x^2 + 12x + 36 - 1 &= \left(x^2 + 12x + 36\right) - (1) \\ &= (x+6)^2 - (1)^2 \end{aligned}$$

Substitute this expression into the original integral.

$$\int \frac{dx}{(x+6)\sqrt{x^2+12x+35}} = \int \frac{dx}{(x+6)\sqrt{(x+6)^2-(1)^2}}$$

Notice that the basic integration formula $\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\,\mathbf{sec}^{-1}\left|\frac{u}{a}\right| + C$, where $|u| > a > 0$, can be used here. Identify the values of a and u in $\int \frac{dx}{(x+6)\sqrt{(x+6)^2-(1)^2}}$.

$a = 1$