

Example 11 Find the value of $\sin 2 \cot^{-1} \frac{-5}{12}$

Solution Let $\cot^{-1} \left(\frac{-5}{12} \right) = y$. Then $\cot y = \frac{-5}{12}$.

$$\text{Now } \sin 2 \cot^{-1} \frac{-5}{12} = \sin 2y$$

$$= 2 \sin y \cos y = 2 \frac{12}{13} \frac{-5}{13} \left[\text{since } \cot y < 0, \text{ so } y \in \left(\frac{\pi}{2}, \pi \right) \right]$$

$$\frac{-120}{169}$$