Find the area of the shaded region in the accompanying figure. Is the graph of

\[ r = 7 \tan \theta, \quad -\frac{\pi}{2} < \theta < \frac{\pi}{2}, \]

asymptotic to the lines \( x = 7 \) and \( x = -7 \)?

The area of the shaded region in the accompanying figure is \( \frac{147}{2} - \frac{49\pi}{4} \).

(Simplify your answer. Type an exact answer, using π as needed. Do not factor. Use integers or fractions for any numbers in the expression.)

Is the graph of \( r = 7 \tan \theta, \quad -\frac{\pi}{2} < \theta < \frac{\pi}{2}, \) asymptotic to the lines \( x = 7 \) and \( x = -7 \)?

- Yes
- No

\[ \theta \in \left[ -\frac{\pi}{2}, \frac{\pi}{2} \right] \]

\[ r = \frac{7\sqrt{2}}{2} \csc \theta \text{ (line)} \]

\[ A = \frac{1}{2} \int_{\theta = 0}^{\theta = \frac{\pi}{4}} r^2 d\theta \]

But there are 3 sectors.

However, \( \boxed{1} \) and \( \boxed{3} \) are equal in area by symmetry.

\[ A = 2A_1 + A_2 = 2 \cdot \frac{1}{2} \int_{\theta = 0}^{\theta = \frac{\pi}{4}} (7 \tan \theta)^2 d\theta + \frac{1}{2} \int_{\theta = \frac{\pi}{4}}^{\theta = \frac{\pi}{2}} (\frac{7}{\sqrt{2}} \csc \theta)^2 d\theta \]

\[ = \int_{\theta = 0}^{\theta = \frac{\pi}{4}} 49 \tan^2 \theta d\theta + \int_{\theta = \frac{\pi}{4}}^{\theta = \frac{\pi}{2}} (\frac{49}{2} \csc^2 \theta) d\theta \]

\[ = 49 \left\{ \tan \theta - \theta \right\}_{\theta = 0}^{\theta = \frac{\pi}{4}} + \frac{49}{2} \left( \cot \frac{\pi}{4} - \cot \frac{\pi}{2} \right) \]

\[ = 49 \left( \tan \frac{\pi}{4} - \tan 0 - 0 \right) + \frac{49}{2} (1 - 0) \]

\[ = 49 \left( 1 - \frac{\pi}{4} \right) + \frac{49}{2} = \frac{23 \cdot 49}{2} = \frac{147}{2} - \frac{49\pi}{4} \text{ unit}^2 \]