Answer on Question #63491 – Math – Trigonometry

Question

Simplify $\sqrt{tan\theta + 1 \cdot cot\theta}$ if $\frac{\pi}{2} \le \theta \le \pi$.

Solution

$$\sqrt{tan\theta + 1 \cdot cot\theta} = \sqrt{tan\theta + cot\theta} = \sqrt{tan\theta + \frac{1}{tan\theta}} = \sqrt{\frac{(tan\theta)^2 + 1}{tan\theta}} = \sqrt{\frac{\frac{1}{(cos\theta)^2}}{tan\theta}} = \sqrt{\frac{1}{tan\theta \cdot (cos\theta)^2}}$$

$$= \sqrt{\frac{cos\theta}{sin\theta \cdot (cos\theta)^2}} = \sqrt{\frac{1}{sin\theta \cdot cos\theta}} = \sqrt{\frac{2}{2sin\theta \cdot cos\theta}} = \frac{\sqrt{2}}{\sqrt{sin2\theta}}.$$

This expression is not defined for value $\frac{\pi}{2} \le \theta \le \pi$, because $sin\,(2\theta)$ should be positive according to the domain of the square root and the denominator, but in fact $sin\,(2\theta) \le 0$ for $\frac{\pi}{2} \le \theta \le \pi$.

Answer: $\frac{\sqrt{2}}{\sqrt{sin2\theta}}$.