Problems

(1) $\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \sin^{-1}\left(\frac{77}{85}\right)$

(2) $4\tan^{-1}\left(\frac{1}{5}\right) - \tan^{-1}\left(\frac{1}{239}\right) = \frac{\pi}{4}$

(3) $ab < 1$

$\tan^{-1} a + \tan^{-1} b = \tan^{-1}\frac{a+b}{1-ab}$

Give the counterexample: $\tan^{-1} 2 + \tan^{-1} 3$ when $ab > 1$

(4) $\tan^{-1}\left(\frac{5}{12}\right) + \sin^{-1}\left(\frac{7}{25}\right) = \cos^{-1}\left(\frac{253}{325}\right)$

(5) $\cos\left(2\tan^{-1} 1/7\right) = \sin\left(4\tan^{-1} 1/3\right)$

(6) $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right) = \frac{1}{2}\tan^{-1} x.$

(7) $\sin \cot^{-1} \cos \tan^{-1} x = \sqrt{\frac{x^2+1}{x^2+2}}$

(8) $\sin^{-1} x + \sin^{-1} y = \pi$

Then, $x^{100} + y^{200} + \frac{2}{x^{200} + y^{100}}$

(9) $4\tan^{-1}\left(\frac{1}{5}\right) - \tan^{-1}\left(\frac{1}{239}\right) = \frac{\pi}{4}$