Problem statement Let $a$ be a positive constant and consider the functions

$$f(x) = \arcsin \left( \frac{x}{a} \right) \quad \text{and} \quad g(x) = a \arctan \left( \frac{x}{a} \right).$$

Find the derivatives of $f$ and $g$ and express them in as simple a form as possible. There is a certain value of $a$ for which the lines tangent to the graphs of these two functions at $x = 1$ are parallel lines. Find that value of $a$ to 3-place accuracy. (Find an exact equation satisfied by $a$, and then get an accurate enough solution from your calculator.)