

(1) [3 points] Determine $\tan^{-1}(\sqrt{3})$.

(2) [5 points] Simplify $\sin(\tan^{-1}x)$. Your final answer should not contain any trigonometric (or inverse trigonometric) functions.

(3) [3 points] Compute the derivative of $y = \cos^{-1}(e^{2x})$.

(4) [4 points] Determine $\lim_{x \rightarrow \infty} \arctan(e^x)$.