Evaluate

$$\lim_{n\to\infty} n \sin\left(4\sum_{k=1}^{6n} \arctan\frac{(1+\sqrt{3})k^2 - 2(1+\sqrt{3})k + 3\sqrt{3} - 1}{(\sqrt{3}-1)k^2 + 2(1-\sqrt{3})k - 3 - \sqrt{3}}\right)$$

where the limit is over integer values of n