Continuous Round Tiebreakers

October 24th, 2020

1. A sequence of polynomials is defined as follows. Let $P_0(x) = x$, and $P_n(x) = 1 - P_{n-1}(x)^2/2$ for all $n \geq 1$. Let γ be the least possible real number such that γ is greater than the largest real root of $P_n(x)$ for all $n \geq 0$. Given that $\gamma = a + b\sqrt{c}$ for positive integers a, b and c such that c is not divisible by the square of any prime, compute $a + b + c$.

2. Let M be the midpoint of side BC of $\triangle ABC$. Let $AB = 9$, $AC = 10$, $BC = 11$. If the distance from B to line AM can be written as $\frac{a\sqrt{b}}{c}$ where a and c are relatively prime and b is not divisible by the square of any prime, find $a + b + c$.