Tiebreaker Round Solutions

AMSA-MAMS Pi Day Mathematics Tournament

March 10, 2018

1. What is the smallest real root of $27x^3 + 54x^2 + 36x - 19 = 0$?

   Answer: $\boxed{\frac{1}{3}}$ Notice that $27x^3 + 54x^2 + 36x - 19 = 0 \rightarrow (3x+2)^3 = 27$. Thus, our only real root is $\frac{1}{3}$.

2. In a single elimination tournament, it took 314 games to declare a winner. How many participants were in the tournament? Assume that no games resulted in a tie.

   Answer: $\boxed{315}$ If it takes 314 games to declare a winner, and one participant is eliminated every game, then 314 participants get eliminated, meaning that there are 315 participants.

3. A 3x3x3 cube is split into 27 1x1x1 cubes. What is the distance between the center of the 3x3x3 cube and one of the corner 1x1x1 cubes?

   Answer: $\boxed{\sqrt{3}}$ The distance from the corner vertex to the center of the larger cube is $\frac{3\sqrt{3}}{2}$ and the distance from the corner vertex to the center of the smaller cube is $\frac{\sqrt{3}}{2}$. Therefore, the distance between the centers is $\frac{3\sqrt{3}}{2} - \frac{\sqrt{3}}{2} = \sqrt{3}$