Homework Assignment 1

Due: Wednesday September 23, 2020 11:59 PM (Eastern Daylight Time)

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After you have completed the assignment, please save, scan, or take photos of your work and upload your files to the questions below. Crowdmark accepts PDF, JPG, and PNG file formats.

Q1 (34 points)

Observe that in $\mathbb{Z}/3$, $x + y + z = 0$ iff x, y, z are all the same or are all different. Use this to show that the 3-colouring invariant $\lambda(D)$ is always a power of 3 and that it can be computed in polynomial time.

Q2 (33 points)

Rather than fixing the Kauffman bracket by using a writhe counter-term, it is tempting to evaluate it at $A = e^{\pi i/3}$, where invariance under R1 holds with no need for a correction. Unfortunately, at $A = e^{\pi i/3}$ the Kauffman bracket of any knot is equal to 1. Prove this.

Q3 (33 points)

Prove that the PD notation of a knot diagram determines it as a diagram in S^2.