Choose 10 of the following problems. You may choose to do more than 10 in which case these extra problems may replace any of your 10 chosen problem at 4/5 the value if this improves your exam grade. You may also earn 1 - 2 bonus points for correctly doing more than 10 problems.

5. Evaluate
$$N\left(\frac{4}{9} + \frac{-10}{3}\right)$$

6. Given: $t = g_1 \mod h_1$ $t = g_2 \mod h_2$ When can you use the Chinese Remainder Theorem?

- 7. When are solutions of tangle equations useful?
 - a. When applied to topoisomerase.
 - b. When applied to recombinases.
 - c. When applied to pure math research.
 - d. All of the above.
- 8. Define knot invariant.
- 9. Currently, the invariant names are linked to Wiki pages, but eventually they will be modified to link to what?
- 10. The database itself is just a simple text file, true or false? Will its format eventually change? Why?
- 11. Draw the Seifert surface for the knots 3_1 and 5_2 . Draw a non-orientable surface whose boundary is the knot 3_1 .
- 12. Calculate the Alexander polynomial of the knot 4_1 .
- 13. Create a projection of a knot that has Dowker notation < 4 6 8 2 >. (Hint: remember to keep the knot alternating).
- 14. Use continued fractions to prove whether or not the following pairs of tangles are equivalent. Are their numerator closures equivalent? Explain.

14A. (-2 3 2) and (3 -2 3) 14 B. (1 2 3) and (3 2 1)

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