

## Basic Knot Types and Invariants

The purpose of this project is for you to develop a sort of “dictionary” of knot types and invariants that you can use as a reference and get ideas from. (It should also get you poking through a lot of books and websites.) Of course, please work together and discuss your results!

### Types of Knots

Define each knot (or link) type listed below. For each type, give one or two examples, as well as one example that is *not* of that type. Then, if possible, determine which types the figure-eight knot  $4_1$  and the seven-crossing knot  $7_7$  belong to.

1. 2-bridge knot
2. 7-crossing knot
3. algebraic knot/link/tangle
4. almost alternating knot
5. alternating knot
6. amphichiral (achiral) knot
7. braid knot
8. Brunnian link
9. composite knot
10. invertible knot
11.  $k$ -almost alternating knot
12.  $M$ -equivalent knots
13. mutant knots
14.  $p$ -colorable knot/link
15.  $(p, q)$  torus knot
16.  $(p, q, r)$  pretzel knot
17. prime knot
18. rational knot/link/tangle
19. reduced knot projection
20. reversible knot
21. splittable link
22. tricolorable knot/link
23. twist knot
24. wild knot

### Knot Invariants

Write down a description of each knot invariant listed below. If possible, compute the invariant for the figure-eight knot  $4_1$  and the seven-crossing knot  $7_7$ . (If not possible, use different knots.)

1. Alexander polynomial
2. bracket polynomial
3. braid index
4. bridge number
5. coloring number set
6. Conway notation
7. crossing number
8. depth of a link
9. determinant of a knot
10. Dowker notation
11. genus of a knot
12. HOMFLY polynomial
13. human knot number
14. Jones polynomial
15. knot graph (planar graph)
16. linking number
17. mod  $p$  rank of a knot
18. Seifert surface
19. stick number
20. twisting number
21. unknotting number
22. Wirtinger presentation
23. word for a braid
24. writhe