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