Math 405: Lie Algebras
Exercise Set 8

You do *not* need to hand your solutions to this homework set.

Use the root space decompositions to show that the following isomorphisms hold. (Please consult Humphreys, pages 2-3, for a complete description and bases of these Lie algebras.)

1. $\mathfrak{sl}(2,\mathbb{C}) \cong \mathfrak{o}(3,\mathbb{C}) \cong \mathfrak{sp}(2,\mathbb{C})$ (type A_1, B_1, and C_1)
2. $\mathfrak{o}(4,\mathbb{C}) \cong \mathfrak{sl}(2,\mathbb{C}) \oplus \mathfrak{sl}(2,\mathbb{C})$ (type D_2 and $A_1 \oplus A_1$)
3. $\mathfrak{o}(5,\mathbb{C}) \cong \mathfrak{sp}(4,\mathbb{C})$ (type B_2 and C_2)
4. $\mathfrak{sl}(3,\mathbb{C}) \cong \mathfrak{o}(6,\mathbb{C})$ (type A_3 and D_3)