Take home midterm Math110AH Due Wednesday Dec 4 on gradescope 11 pm

From text page 57(nominal p 65), end of 10th section

Problem 5

Problem 6

Problem 11

Plus two additional problems

1. If G is a finite group with order 2n, where n is an odd positive integer then G has a subgroup of order n.

(Suggested method: Associate to each g in G the action on G defined by right multiplication by g. This defines an injective homomorphism of G into the group of permutations of the elements of G. Show the image of this homomorphism contains some permutation of odd sign, so that the subgroup consisting of the permutations of even sign has index 2 )

1. Let G be a group of order 30. According to the previous problem, G has a subgroup of order 15 , which is necessarily normal. Prove that G has another nontrivial normal subgroup

(nontrivial means not equal to G and not equal to the identity alone). Suggested method: To show that there is a normal p-Sylow subgroup either for p=3 or p=5