

Math 401 - 01 Homework (Fall 2018)

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\newcommand{\aut}{\textrm{Aut}} \newcommand{\inn}{\textrm{Inn}} \newcommand{\sub}{\textrm{Sub}}
\newcommand{\cl}{\textrm{cl}} \newcommand{\join}{\vee} \newcommand{\bigjoin}{\bigvee}
\newcommand{\meet}{\wedge} \newcommand{\bigmeet}{\bigwedge} \newcommand{\normaleq}{\unlhd}
\newcommand{\normal}{\lhd} \newcommand{\union}{\cup} \newcommand{\intersection}{\cap}
\newcommand{\bigunion}{\bigcup} \newcommand{\bigintersection}{\bigcap} \newcommand{\sq}[2][\
]{\sqrt[#1]{#2},} \newcommand{\pbr}[1]{\langle #1\rangle} \newcommand{\ds}{\displaystyle}
\newcommand{\C}{\mathbb{C}} \newcommand{\R}{\mathbb{R}} \newcommand{\Q}{\mathbb{Q}}
\newcommand{\Z}{\mathbb{Z}} \newcommand{\N}{\mathbb{N}} \newcommand{\A}{\mathbb{A}}
\newcommand{\F}{\mathbb{F}} \newcommand{\T}{\mathbb{T}} \newcommand{\ol}[1]{\overline{#1}}
\newcommand{\imp}{\rightarrow} \newcommand{\rimp}{\leftarrow} \newcommand{\pinfty}{1/p^{\infty}}
\newcommand{\power}{\mathcal{P}} \newcommand{\calL}{\mathcal{L}} \newcommand{\calC}{\mathcal{C}}
\newcommand{\calN}{\mathcal{N}} \newcommand{\calB}{\mathcal{B}} \newcommand{\calF}{\mathcal{F}}
\newcommand{\calR}{\mathcal{R}} \newcommand{\calS}{\mathcal{S}} \newcommand{\calU}{\mathcal{U}}
\newcommand{\calT}{\mathcal{T}} \newcommand{\gal}{\textrm{Gal}} \newcommand{\isom}{\approx}
\newcommand{\idl}{\textrm{Idl}} \newcommand{\lub}{\textrm{lub}} \newcommand{\glb}{\textrm{glb}} $

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Problem Set 13 (complete) Due: 12/10/2018, optional (bring to review session)

- Let D be an I.D., $D[x]$ the ring of polynomials over D , and $D(x)$ the field of rational functions over D . Let F be the field of fractions of D , $F[x]$ the ring of polynomials over F , and $F(x)$ the field of rational functions over F . Show that $D(x) = F(x)$.
- Prove that the operation that defines the external semi-direct product is in fact associative.
- Prove that the two non-abelian semi-direct products of C_7 with C_3 are isomorphic. (Hint: use the homomorphism discussed in class, given by: $a \mapsto u, b \mapsto v^{-1}$)

Problem Set 12 (complete) Due: 12/03/2018. Board presentation: 12/07/2018

- Chapter 14, problems 12, 14. Warning: pay attention to the definition of AB .
- Chapter 14, problem 28. What about the converse?
- Write $n \in \mathbb{Z}$ as md_0 , where d_0 is the last digit (base 10) and m consists of all other digits. In other words, $n = 10m + d_0$. Prove that n is divisible by 7 iff $m - 2d_0$ is divisible by 7.

Problem Set 11 (complete) Due: 11/20/2018. Board presentation: 11/27/2018

- Chapter 12, problem 18. Moreover, if R is commutative, then S is an ideal of R .
- Chapter 12, problem 28.
- Chapter 13, problem 52.
- Chapter 13, problem 34.

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