MATH 407 4/4/18 ( hap 3.3 (contd.) o) bol ( contd) noitabourse finendos es emos zitoorak (or strings)

Words in S: Si, Fz, ..., Fk E (S) (S, S, t, S, t) · (T, T, T, T) (S<sup>±</sup>,..., S<sup>±</sup>)-1 = S<sup>±</sup>, ..., S<sup>±</sup> (s)0) ~1 Strings in Sare closed under + and . II + => (a,b, a,b,) (c, d,b, a), a) x, 2 7[ Def. G., G. are groups

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Def. G., G. are groups iff for any {a,b} \( \bar{a} \) = \( \bar{a} \) \( \bar{a} If Disabijection, then it's isomorphic Prop. If \$ is a honomorphism, then  $\int \Phi(e_1) = e_2$   $\int \Phi(a^{-1}) = \left[\Phi(a)\right]^{-1} \forall a \in G$ 

Pf. e, only g & G, b, g2=gon (a) At (20)  $\left[\Phi(e,)\right]^2 = \Phi(e,)\Phi(e,) = \Phi(e,) = \Phi(e,)$ 

ii) \$\phi(a)\$(\alpha)\$ (\alpha) \tale \alpha \tale \alpha) \tale \alpha \tale \alph

4 11 = \$ (e,) = e, (ch hidgemobile) = 's')

Equato do solhalar sonalaringo ta (o "bi-sull

\* Let \$: 6, > 6, \*Order Grands

be homomorphisms

then \$\P\_2 \cdot \P\_1 \cdot \Gamma\_1 \cdot \Gamma\_2 \cdot \Gamma\_1 \cdot \Gamma\_2 \cdot \Gamma\_1 \cdot \Gamma\_2 \cdot \Gamma\_2 \cdot \Gamma\_1 \cdot \Gamma\_2 \cdot \Gamma\_2 \cdot \Gamma\_1 \cdot \Gamma\_2 \cdot \Gamm

五,0 頁, (ab): 頁, (車, (ab)) ·  $= \overline{\Phi}_{2} \left( \overline{\Phi}_{1} \left( \Delta \right) \overline{\Phi}_{1} \left( \overline{\Phi}_{1} \right) \right)$   $= \overline{\Phi}_{2} \left( \overline{\Phi}_{1} \left( \Delta \right) \right) \cdot \overline{\Phi}_{2} \left( \overline{\Phi}_{1} \left( \overline{\Phi}_{1} \right) \right)$ 

\* If \$: G, > G, is isomorphic,

then \$\Pi': G\_z > G, is also isomorphic.

Pf Let a, b ∈ G, have c=\$ (a), d=\$, (b) \text{ Then, } a=\$\Phi\_1'(c), b=\$\\\ \frac{1}{2}, (d)

Look at: \$\overline{\phi}(cd) = \overline{\phi}(\phi, (ab)) = ab = \$ (c) \$ (d) Cor. If G is a group, then,

Aut(G) = {\$\Pi: G \rightarrow G isomorphism }} (is a group. (s) o(s) o (s) o \* Let G, ~ Gz if there is isomorphism \$: G, > Gz ('~':= is isomorphic to) Thm. '2' is an equivalence relation on groups. 1) Reflexivity: G=G 11) Symmetry: C, 26, 200 to the \$ (G) > G (G) . O . O Then, \$ -1. Gz > G, 6 (6) - 5) OF G, ~ G, -111) Transitivity: G, ~ Gz, Gz ~ Gz) then Gi ~G3 (by composition) \* Isomorphism Classes: [G] = {H: G = H} (ds) = (bs) = ta Hool Ex \* [ { 2 e 3 ] ~ = { { e 3 }

\* If p is prime, |G|= pthen G= Zp ([Zp]) \* Din > ah is isomorphism for om Zp to G.

(n, thz) > ahithz

= ahithz ([Zp]~) \* If a is infinite cyclic a= da) = oilopo zi quorados pal Zo-s G, isomorphism HI= 6, 2 2 2 2 2 (0 10) 10, EC P 20 20 X [Zy], Klein Group (not cyclie) ZxZ2 Dx, 2 C, 2:0 (0,0) (1,0) (0,1) (1,1) (0,0) (0,0) (1,0) (0,1) (1,1) (0,1)(0,1) (0,1) (1,0) (0,0) (1,0)(0,1) (1,0) (0,0) (Caral) - Dx D field (a, s)==(a, a)

\* Order 6: [Z6], [S3] La,b), ab=ba, a2b=ba \* C, xG2 direct product (a, az) · (b, bz) = (a, b, azbz), o(a, az) = lom(o(a,), o(az)) \* 6, x 6, cyclic. Any subgroup is cyclic H1=6, x { e23 = {(a,1e2): a, E6, } 2000 H2 = {e,3 x h2 = {(e,a2): a2 ( h2}  $\Phi': C' \to C' \times C'^{s}$  $\Phi$  (a) = (a, e<sub>2</sub>) \$ 2: 62 → 61 × 62 0) (00) × ₫2(a2) = (e, a2) 0 6 (0.1) (0,0) (0,0 (0,0) (1,1) (0,0) (0,1) (0,1) \* Let La, >= G, Laz> = Gz (10) (10) [G, = 0(a,), | Gz = 0 (az) 16, x62 = 0 (a,).0 (a2) Want G, xGz = ((a,az)) (a, x Gz) = 0 (a, az) Ex \* 1303 1 = 33032

(G, x G2) = 0 (a,) 0 (a2) (a) = |cm (o(a,), o(a,)) iff g cd (o(a,), o(az)) = 10 4009 691/941 - 92 Lg200000 472 x 23 x 23 x 2 x 2 5 5 Zx x Zm are cyclic iff gcd(n, m)=1 29 ilgare a 21 deranosi alt. D. J. (d b) ab farfarented for a: t 20 5 - 2 10 Markers (12) Real Argelian D 6 - 2 200 1 10(6)0(4) of a = Las = 30 - 1 = [] = [] (a B (a. H. a) 562 2 [2] (d Ordonosale Da - D. F. II. ENE gord 1=((a) 8) 0 met 1=(a) 0 1t/a Prop De bithe burd and old en De II (d a) 2/102/m/h o lopo 20 12/11/6 [2] D.G. - Go. 49 - mamage - 1 3 To 2[ .20) The (s) o / (s) t) o (s) 6) \$ (42) In as distances (6) \$ \$ (1 (a) \$6 (1) do sout sud known of A ()