Homework 5 Problem 1 1. The set of stirage over the alphabet Z: feed & wish more as then bs. R: S -7 XaX R: S -7 XaX R: S -7 XaX R: S -3 Xa b X a S b Rs: X -3 ax b X a S b Rs: X -3 ax b X E Problem 2 A: faib'ck i=j' where i, j.k ≥ 0 \forall S A: faib'ck i=j' where i, j.k ≥ 0 \forall S A: faib'ck i=j' where i, j.k ≥ 0 \forall S CF(n of Lesquage A, Union of languages A; and A; R: M -3 aM K R: M -3 aM E R: N -5 b N C E R: X -7 C X E R: Y -3 aX E This grammor is ambiguous because it is the union of languages A; and A; an		
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R ₁ : S -> XaX R ₂ : X -> aXb bXa XX a E 2. The complement of the larguage £ a^b^ nzo² R ₁ : S -> Xa bX aSb R ₂ : X -> aX bX E Problem 2 A= £ a'b'c'k i=j or j=k where i,j:k≥0³ A= £ a'b'c'k i=j where i,j:k≥0³ A= £ a'b'c'k j=k where i,j:k≥0³ CFG of Larguage A, Union of larguages A ₁ and A ₂ R ₁ : S -> MX YN R ₁ : M -> aMb E R ₂ : N -> bN C E R ₃ : N -> bN C E R ₄ : X -> CX E R ₅ : Y -> aX E This grammar is ambiguous because it is the union of larguages A, and A ₂ which has an intersection that is of all storage aibick where injector that is of all storage aibick where injector that is of all storage aibick where injector to the as well as if YN is chosen it can lead to this as well as if YN is chosen in rule1.	L.	The set of strings over the alphabet 2: faib & with more a's
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R1: S -> Xa bX aSb P2: X -> aX bX E Problem 2 A= faibick i=j or j=k where i,j,k >03 A= faibick i=j where i,j,k >03 A= faibick j=k where i,j,k >03 CFG of Longuage A, Union of languages A, and A2 R1: S -> MX YN R1: M -> aMb E R3: N -> bN C E R4: X -> CX E R5: Y -> aX E This grammer is ambiguous because it is the union of languages A, and As which his an intersection that is of all storage aibick where i,j, and ke are all reval. This means ip MX is chosen it can lead to this as well as if YN is chosen in rule 1.	2.	The complement of the larguage farb" n = 03
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Problem 2 A = \(\frac{1}{a} \) \\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		R: S - Xalbxlasb
Problem 2 A = 2 a b c i = j or j = k where i, j k > 0 3 A = 8 a b c i = j where i, j k > 2 3 A = 8 a b c j = k where i, j k > 2 3 CFG of Longuage A, Union of languages A, and A2 A: S -> M X Y N 1: M -> a M b 8 13: N -> b N C 8 15: Y -> a X 8 This grammer is ambiguous belonge it is the union of languages A, and As which his an introcutum that is of an storage ai bick where i, j and k are all equal. This means ip MX is chosen it can lead to this as well as if YN is chosen in rule 1.		
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	For example two different left most derivatives land for	· the
	Some glyrey abl.	
	S = > MX = > aMbX = 7 a EbX = 7 a Eb CX = 7 a Eb CE	Elabo
The state of the s	2) S=> YN=> axN=> aEN=> aEbNC=>aEbEN= a	bC
	28 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2	
	Problem 3	
	was a second to the second sec	
	R: A -> BABIBIE	
	A,: B → 00 E	
		1000
	Step O cre-le a new start variable	
	4: 8-3A	
	Rz: A -> BAB BIE	
	1,: B -> 001E	
	Step 1 remove 2-productions	
	1. S -> A E	
	1: A → BABIBIABIBAIAIBB	
	a3: B → 00	
	Step 2 remove Unit Production in #2	
	L2: A - BAB OOLABIBA IBB	
	Step 3 remove Unit Production in IL,	
	RIS -> BABIDOLABIBALBBLE	
	LIS - BABIOOLABIBALBBIE	
	12: A - BABLOOLABIBALBB	
	23: B → 00	His Land Control of the Control of t

	Step 4 move all tomorals to unit productions were RHS is one terminal
	1: 13 -> BABIXXIABIBAIBBIE
	11: A -> BAB [XX ABIBA BB
	$n_3: B \to X \times$
	Ry: X → 0
	Step 5 create two variable RHS, by replacing long production rules
	Z: S -> YBIXX ABIBA BBIE
	12: B -> YB X X AB BA BB
	a3: B -> xx
	P4: X -> 0
	Rs: Y → BA
10.5	