Given the grammar

$$A_1 \to A_1\alpha_1 \mid A_2\beta_1$$
$$A_2 \to A_2\alpha_2 \mid A_1\beta_2 \mid A_3\beta_3$$
$$A_3 \to A_3\alpha_3 \mid A_2\beta_4 \mid \beta_5$$

Please convert left recursion to right recursion.

ANS:

$A_1 \to A_2\beta_1 A_1'$

$A_1' \to \alpha_1 A_1' \mid \lambda$

$(A_2 \to A_2\alpha_2 \mid A_1\beta_2 \mid A_3\beta_3 \Rightarrow A_2 \to A_2\alpha_2 \mid A_2\beta_1 A_1'\beta_2 \mid A_3\beta_3)$

$A_2 \to A_3\beta_3 A_2'$

$A_2' \to \alpha_2 A_2' \mid \beta_1 A_1'\beta_2 A_2' \mid \lambda$

$(A_3 \to A_3\alpha_3 \mid A_2\beta_4 \mid \beta_5 \Rightarrow A_3 \to A_3\alpha_3 \mid A_3\beta_3 A_2'\beta_4 \mid \beta_5)$

$A_3 \to \beta_5 A_3'$

$A_3' \to \alpha_3 A_3' \mid \beta_3 A_2'\beta_4 A_3' \mid \lambda$

注意事項： 括號內為代換結果，並非最終解答