

**CHAPTER 22 THE ADJUSTED WINNER METHOD: HOMEWORK**

1. In class we found one division resulting from the adjusted winner method for the following problem. Below you will find an alternate division that results from using the adjusted winner method.

$A$  and  $B$  want to share a cake with five homogeneous components,  $C_1$  to  $C_5$ . Their valuations are as follows:

	$C_1$	$C_2$	$C_3$	$C_4$	$C_5$
$A$	$\frac{1}{10}$	$\frac{5}{10}$	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{1}{10}$
$B$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{3}{10}$	$\frac{2}{10}$	$\frac{3}{10}$

Answer the following questions.

- (a) Let  $p$  be the fraction of component  $C_4$  that  $A$  receives. Find the value of  $p$  corresponding to the division

$$A : C_2 + C_1 + pC_4,$$

$$B : (1 - p)C_4 + C_3 + C_5$$

- (b) To what threshold value  $r$  does this division correspond?  
 (c) Check that this division is indeed equitable.  
 (d) Explain why this division is Pareto-optimal.

2. Suppose  $A$  and  $B$  divide a cake consisting of 4 homogeneous components,  $C, S, P,$  and  $W$ . Suppose the valuations are

	$C$	$S$	$P$	$W$
$A$	$\frac{6}{15}$	$\frac{3}{15}$	$\frac{1}{15}$	$\frac{5}{15}$
$B$	$\frac{6}{15}$	$\frac{3}{15}$	$\frac{3}{15}$	$\frac{3}{15}$

Find 2 *different* divisions using the adjusted winner method and check that each of them is equitable.