Technische Universität München Fakultät für Informatik Lehrstuhl für Effiziente Algorithmen Prof. Dr. Harald Räcke Chintan Shah Summersemester 2013 Übungsblatt 9 June 20, 2013

## Efficient Algorithms and Datastructures II

## Aufgabe 1 (10 Punkte)

The First-Fit heuristic for solving the bin packing problem takes each object in turn and places it in the first bin that can accommodate it. Show that this approach gives a factor 2 approximation algorithm for bin packing. Give an example on which First-Fit does as bad as  $\frac{5}{3}$  OPT.

## Aufgabe 2 (10 Punkte)

Consider a more restricted algorithm than First-Fit, called Next-Fit, which tries to pack the next item only in the most recently started bin. If it does not fit, it is packed in a new bin. Show that this algorithm also achieves factor 2. Give a factor 2 tight example.

## Aufgabe 3 (10 Punkte)

Say that a bin packing algorithm is monotonic if the number of bins it uses for packing a subset of the items is at most the number of bins it uses for packing all n items. Show that whereas Next-Fit is monotonic, First-Fit is not.