

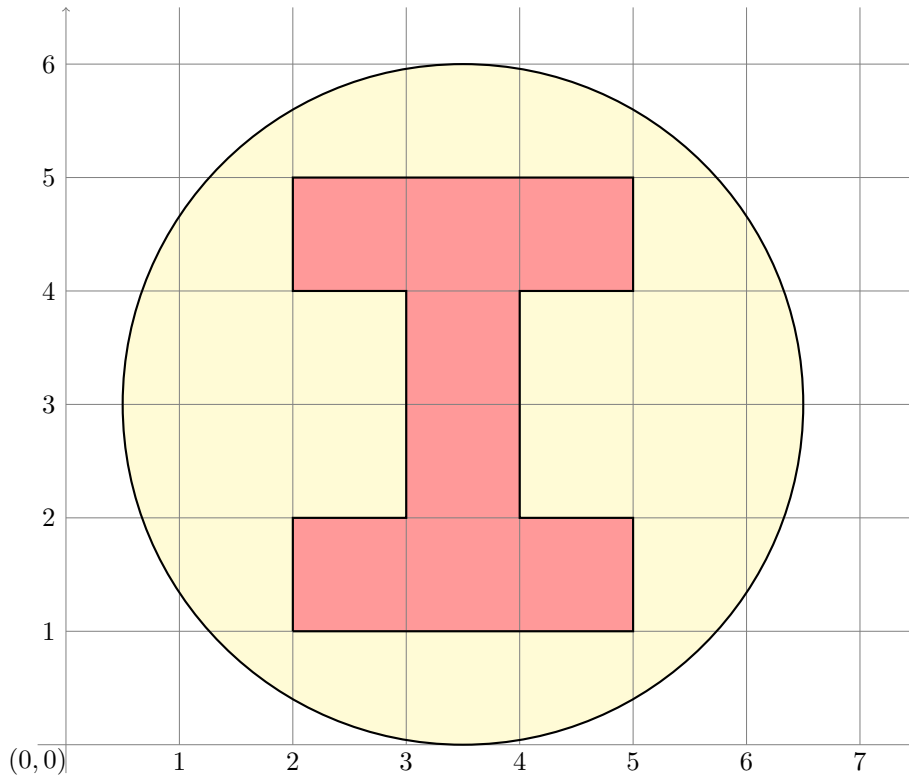
## IE709, IEOR for Health Care

Assignment 3, March 20, 2018

Due March 30, 2018 on Moodle

Note: There are 2 questions on 1 pages. Detailed report (pdf format) and all programs should be uploaded on Moodle in a zip file. All graphs, figures etc must be included in the report and not uploaded separately. Work in teams of two or one. Clearly write the names and roll numbers of the team members in the report.

1. Suppose we want to design an IMRT setup to obtain a dose corresponding to the following figure.



Assume that we want to achieve close to 10 units of radiation in the red region (denoting a tumor) and be as much below 4 units as possible in the remaining portion. You may assume the radiation intensity diminishes to half every 4 units (which means that this relation is not linear).

Assuming that each beam is 1 unit wide, find a suitable configuration of beam weights and angles that can realize a plan as close as possible to the desired treatment. You may further assume that each beam is composed of 20 small beamlets each of whose intensities can be controlled separately.

Solve one of the LPs or QPs proposed described by Shephard et al and find the optimal configuration. Describe the configuration in a readable manner. Also draw a pictorial representation of the intensity pattern achieved by your proposed solution. Comment on its quality. Clearly state all your assumptions and choices of parameters.

2. Consider the network flow model described by Ahuja and Hemacher for deciding optimal beam-on time. Show that any solution of the original LP is also a solution of the network flow LP. Next, either show that the converse is also true (i.e., every solution of the network flow LP is also a solution of the original LP) or provide a counter example.