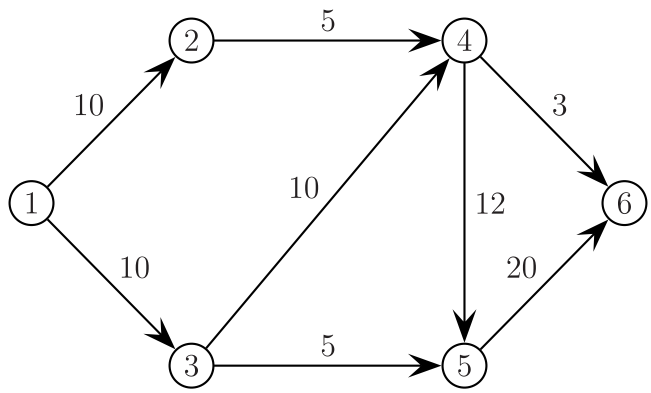
Math 354 Summer 2004 Due Monday 8/16/2004

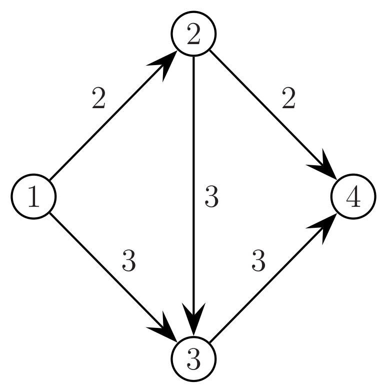
Homework #7

This homework covers sections 5.1-5.5.

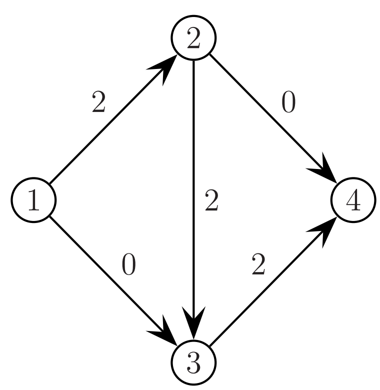
1 Find a maximal flow from the source (vertex 1) to the sink (vertex 6) in the following network using the Ford-Fulkerson Algorithm. Prove that your flow is optimal by exhibiting a cut with the same capacity. (Extra copies of the graph are included at the end of this homework for you to use.)



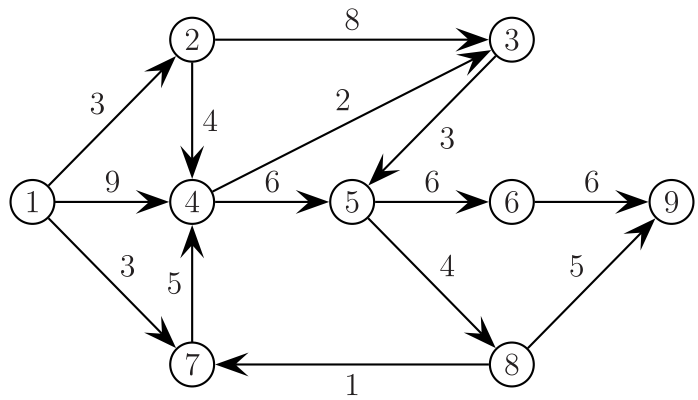
2 Consider the following network with source 1 and sink 4.



Extend the following flow to an optimal flow using the Ford-Fulkerson Algorithm. Then prove that you have achieved an optimal flow by exhibiting a cut with the same capacity. (There are also extra copies of this graph at the end of the homework.)



3 Use the algorithm from Section 5.5 of your book (which is also the algorithm I presented in class) to compute the shortest path between vertex 1 and vertex 9 in the following digraph.



4 Use the Hungarian Method to solve the following integer programming problem. Be careful to note that this is a maximization problem.

The Rutgers football program needs to assign positions to four new players. Each can play quarterback (QB), tight-end (TE), wide receiver (WR), and cornerback (CB) moderately well, but the team can have only one new player at each of these positions. The chart below shows the value that each player will add to each position.

	QB	TE	WR	CB
Ben	5	8	4	4
Bob	3	3	4	3
Jim	4	5	3	5
Ross	3	3	5	6

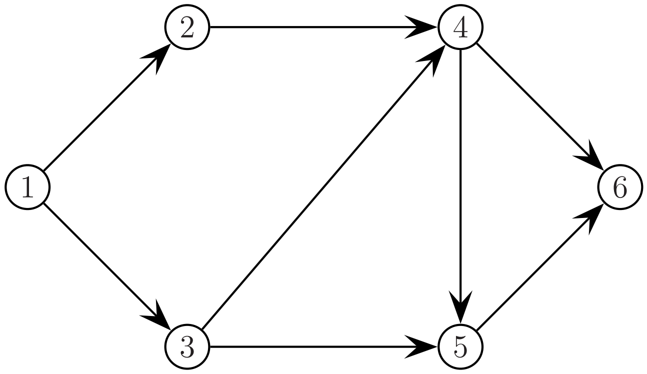
How should the team assign positions to these four players in order to maximize the total value added?

5 Use the Transportation Algorithm to solve the following integer programming problem.

A company has two factories and two warehouses. The cost to transport 1 unit of material between the factories and warehouses appears below.

	to	
from	1	2
1	5	7
2	5	6

Both factories can supply 100 units, and both warehouses demand 75 units. Minimize the total transportation cost.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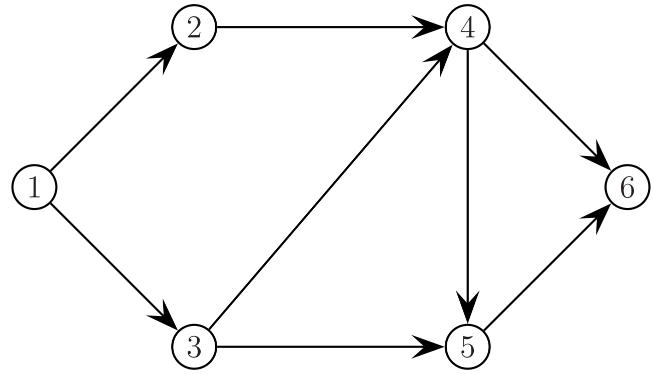
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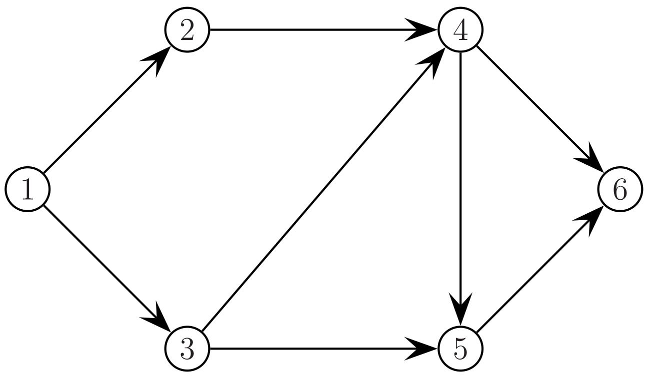
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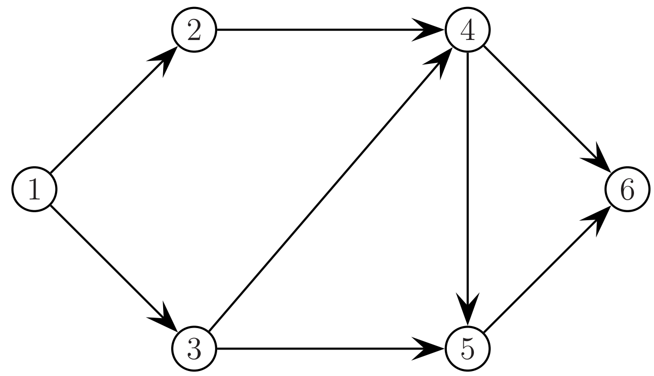
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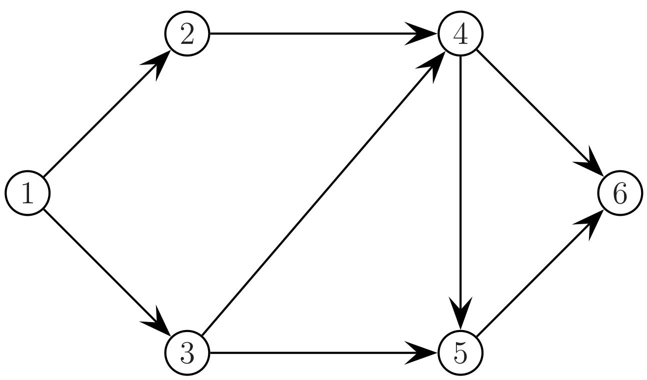
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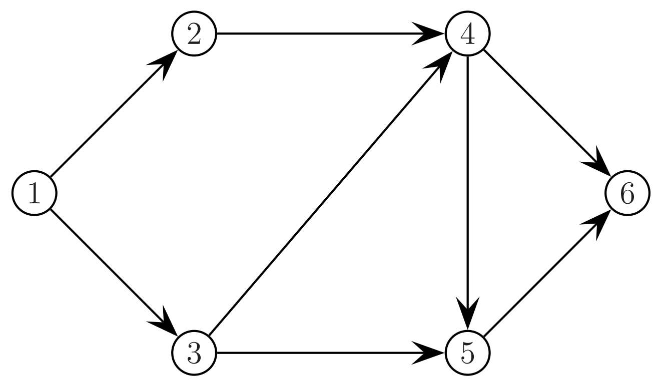
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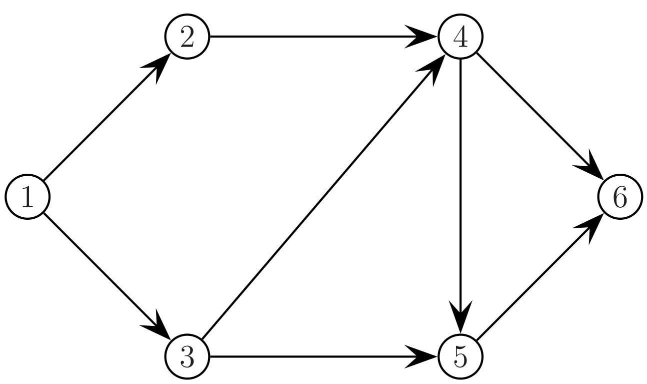
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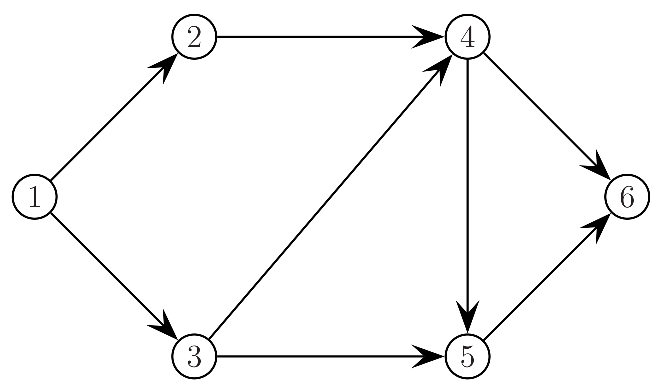
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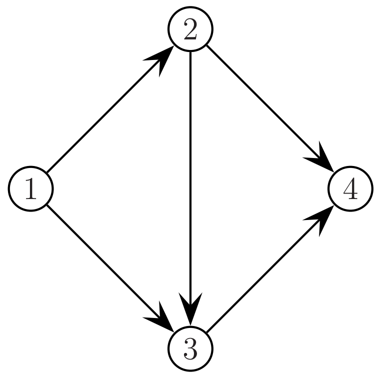
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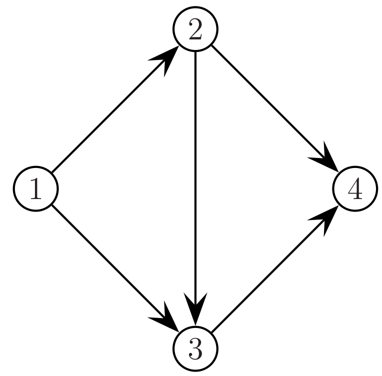
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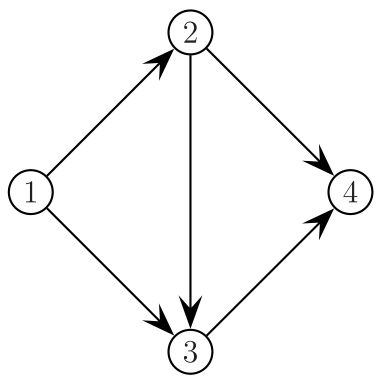
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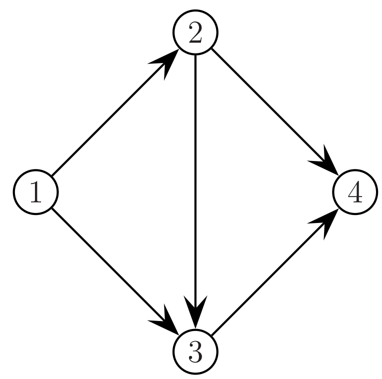
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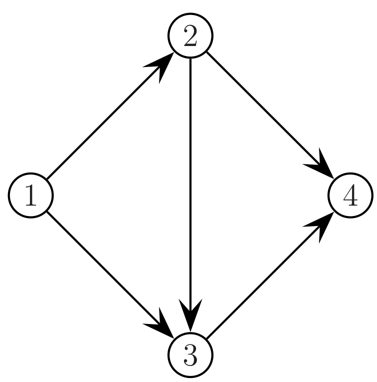
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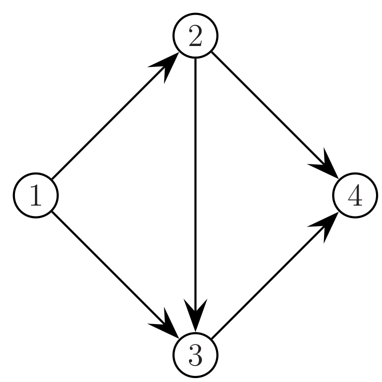
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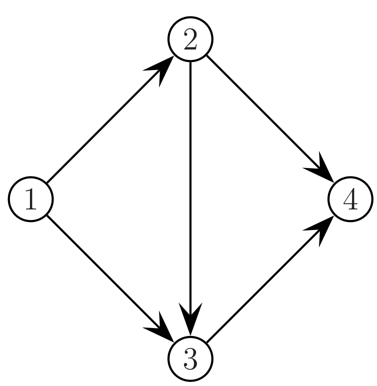
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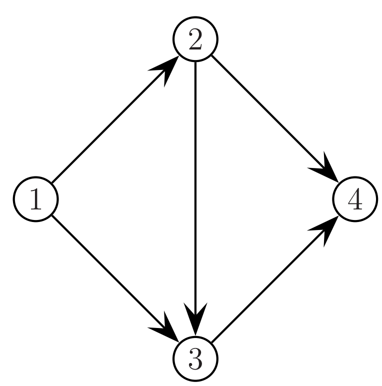
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