MA162: Finite mathematics

Jack Schmidt

University of Kentucky

February 23, 2010

Schedule:

- HW B2 is due Monday, Mar 1st, 2010.
- HW B3 is due Sunday, Mar 7th, 2010.
- Exam 2 is Monday, Mar 8th, 5:00pm-7:00pm.
- My office hours are Tuesday and Thursday, 2:30pm-4:00pm in CB63

Today we will cover 3.3: method of corners

3.2: Quiz review

- Variables:
  Let S be the number of days we operate the Saddle Mine
  Let H be the number of days we operate the Horseshoe Mine

- Constraints:
  $50S + 75H \geq 650$ (gold production constraint)
  $3000S + 1000H \geq 18000$ (silver production constraint)
  $S \geq 0, H \geq 0$ (standard inequalities)

- Objective:
  Minimize $C = 14000S + 16000H$ subject to the constraints

3.3: Many choices but only one result

- Suppose we earn \$4 for every Aurora bracelet and \$3 for every Babylon bracelet
- If we sell 6 Auroras and no Babylons we make \$24
- If we sell 8 Babylons and no Auroras we make \$24
- If we sell 3 Auroras and 4 Babylons we make \$24
- Many different production goals have the same expected revenue
- What does the collection of all goals earning us \$24 look like?
- Well, $R = 4x + 3y$, and the collection is just all points (x, y) such that $R = 24$, that is, $4x + 3y = 24$

3.3: Many choices for a slightly different result

- What if we wanted to take in \$48 instead? ($R = 4x + 3y$)
- We could sell 12 Auroras and no Babylons
- We could sell 16 Babylons and no Auroras
- We could sell 6 Auroras and 8 Babylons
- The line has become $48 = 4x + 3y$, parallel to the first
- We wanted to double the revenue, so we had to double the production

3.3: Iso-revenue lines

- For a given revenue function, like $R = 4x + 3y$, we can graph a bunch of iso-revenue lines where the revenue is some particular value
- Each of these lines is parallel, like $24 = 4x + 3y$ and $48 = 4x + 3y$
- If we have unlimited supplies, we should just make unlimited quantities of x and y and take in BILLIONS
- But we don't. We have a feasible region describing what we can do in the short term.
- We want to find the largest revenue that is **feasible**
- Look at the examples handout,
  explain why $R = 22$ is not the maximum revenue possible

3.3: Method of corners

- The optimal value of an objective function over a **bounded** region always occurs at a **corner**

  Sometimes there is more than one way to get the optimal value

- To find the optimal value, just try each of the corners and choose the best one!

- This means we need to have the corners available

- That might mean graphing the lines and finding intersections

- As we start out, the corners are given, but the quiz and the exam require you to find them

3.3: Method of corners (degeneracy)

- How can there be more than one way to achieve the optimum?
- The optimum occurs at a corner. Can it also occur "inside"? **No**
- Can it occur at two corners? **Yes! It also occurs all along that entire edge!**
- Can it occur at three corners? **No. Then it would also occur inside.**
- Homework problems asking you about the optimum occuring more than once are actually asking you to find the equation of an edge.

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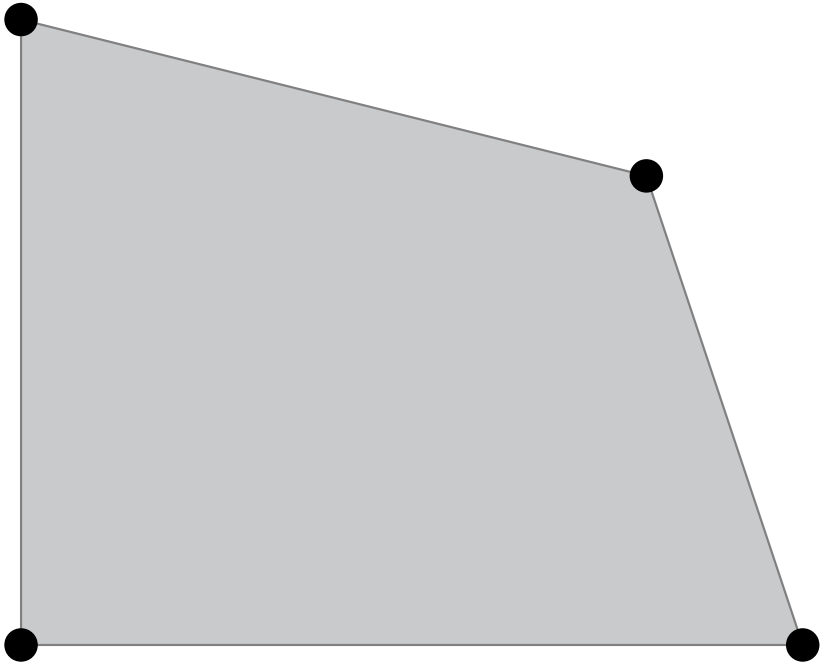

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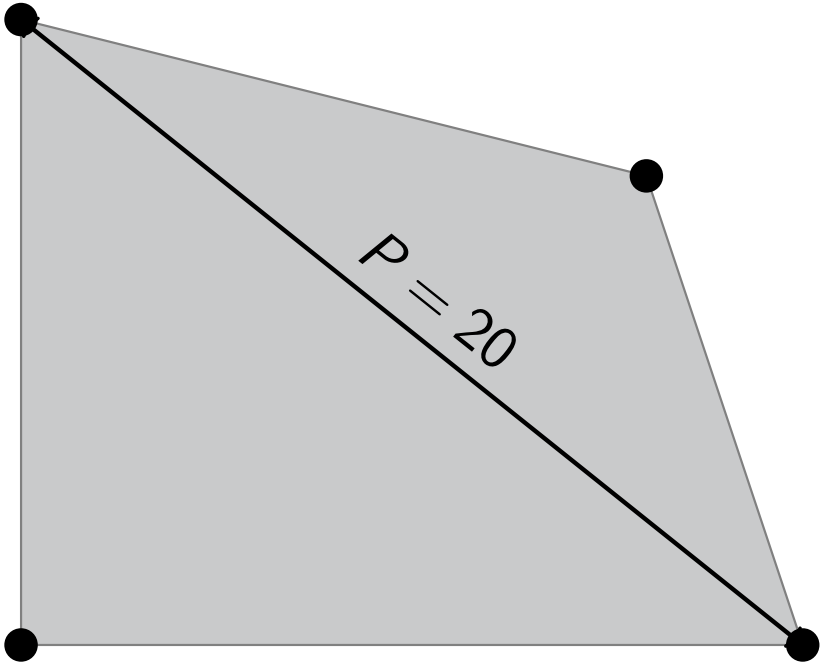

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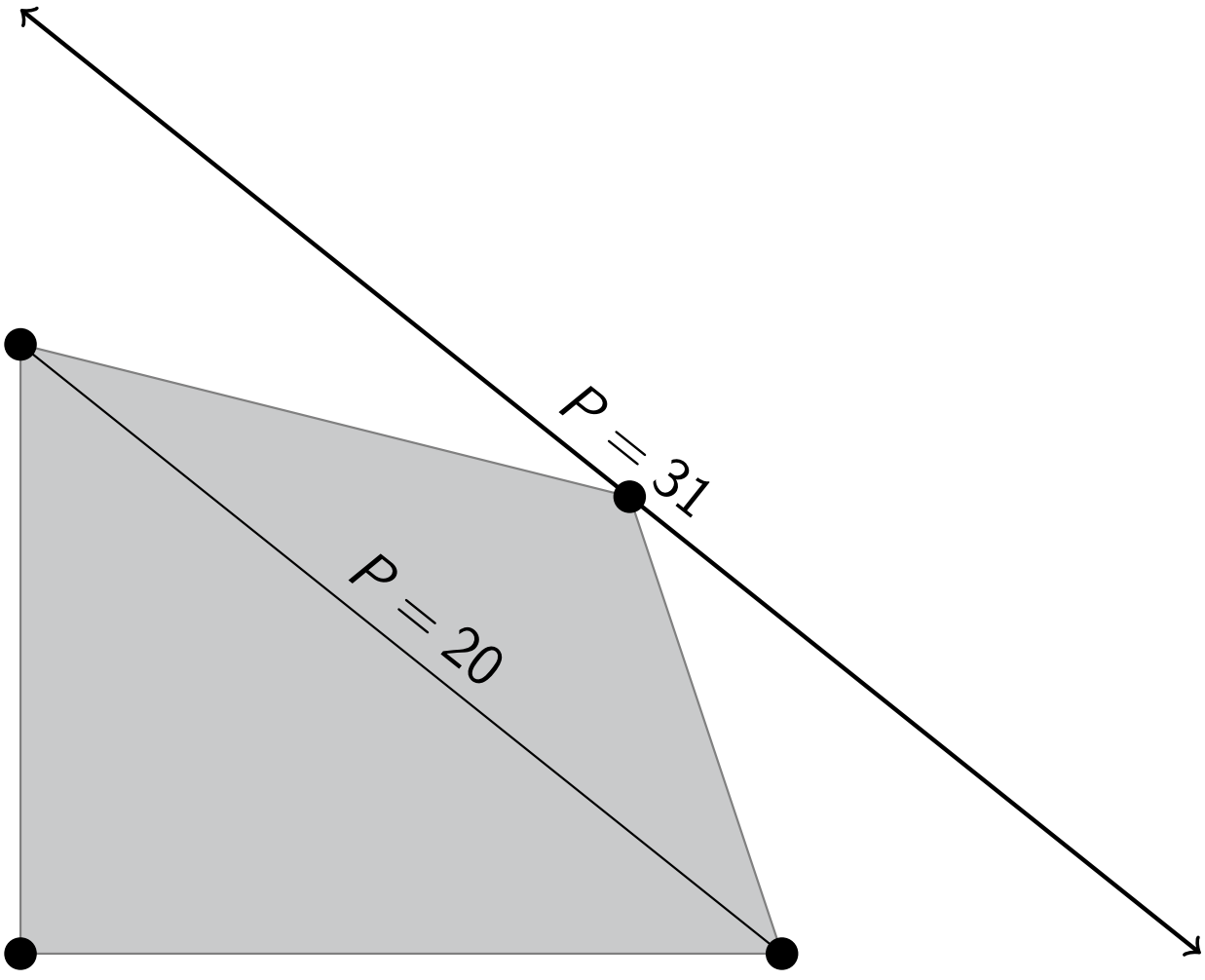

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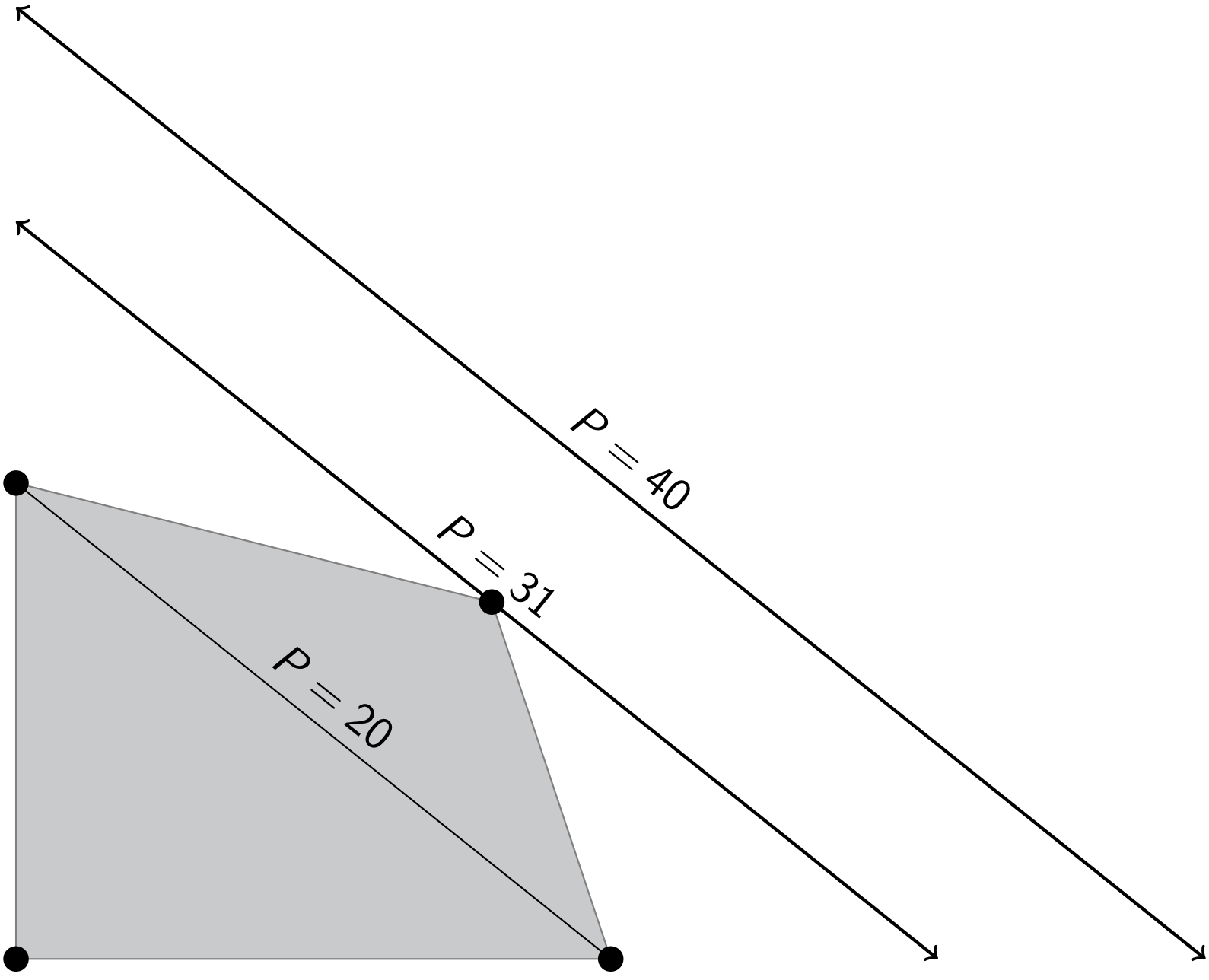

Homework: Tricky homework type

- Struggling is good; don't worry, don't give up
- You should be able to do all of B2 (and should be half done)
  Today we learned to do HW B2 #s 8-12
- Many of the problems are easy; you can do them today
- I am just waiting to help my students with homework
  Tuesday and Thursday, 2:30pm-4:00pm, CB63
  8 other MA162 instructors also want to help