Optimization
part 2

1. Production of an item has fixed costs of $10000 and variable costs of $2 per item.

   (a) Express the cost C of producing q items.

   (b) The relationship between price, p, and quantity, q, is linear. Market research shows that 10,100 items are sold when the price is $5 and 12,872 items are sold when the price is $4.50. Express q as a function of p.

   (c) Express the profit earned as a function of *only q*.

   (d) How many items should the company product to maximize profit?

2. An offshore oil well is located in the ocean at a point W, which is 5 miles from the closest shorepoint A on a straight shoreline. The oil is to be piped to a shorepoint B that is 8 miles from A by piping it on a straight line under water from W to some shorepoint P between A and B ad then on to B via a pipe along the shoreline. If the cost of laying pipe is $100,000 per mile under water and $75,000 per mile over land, where should the point P be located to minimize the cost of laying the pipe?
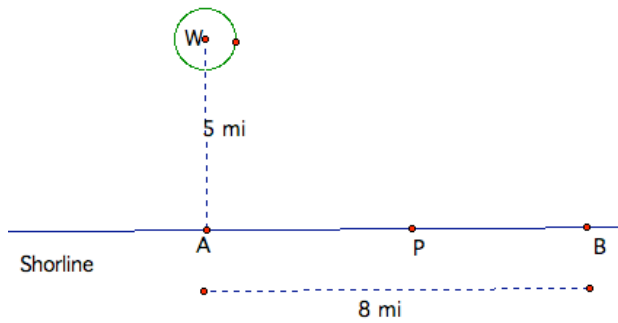
3. You run a small furniture business. You sign a deal with a customer to deliver up to 400 chairs, the exact number to be determined by tthe customer later. The price will be $90 per chair up to 300 chairs, and above 300, the price will be reduced by $0.25 per chair (on the whole order) for every additional chair over 300 ordered.

   (a) Write down the revenue as a function of number of chairs sold q. Note, you might want a piece-wise defined function here.

   (b) What is the largest and smallest revenues your company can make under this deal?