Section Exercise 4

1)

a) What is a production function? With the aid of an example, what can change the shape of a producer's production function?

b) Say that a sandwich company uses two inputs, 'labor' and 'bread', to make its output. Explain what it would mean for this producer to have (i) diminishing returns to labor, but (ii) constant returns to scale.

2) Jim's Haggis is a profit-maximizing haggis producer in the perfectly competitive haggis in- dustry. Their marginal cost is given by 8Q, where Q is quantity produced, and the price of their output is $40 per unit.

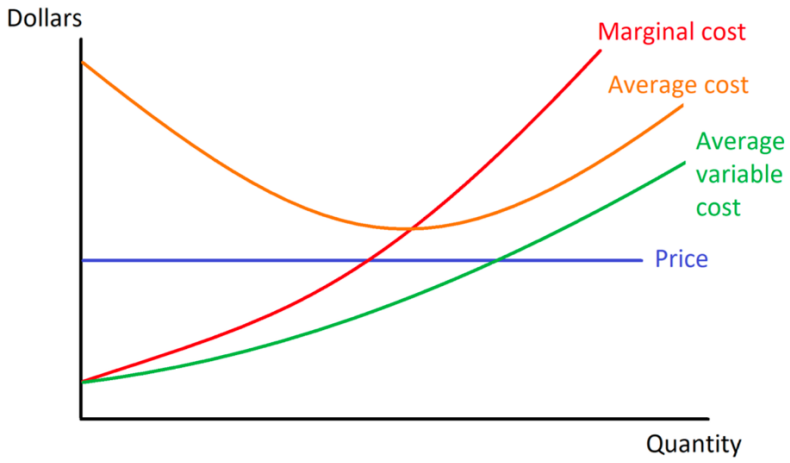
   a) Find this producer's profit-maximizing choice of output. Explain the equation that you used. Do we know whether Jim's Haggis is profitable? Why or why not?

   b) Jim is planning to stay in business for now, but to shut down once the lease on his kitchen space expires. What do we know now about the profitability of Jim's Haggis and the size of his various production costs? Explain.

3) A profit-motivated producer in a competitive industry has a cost function given by $C = F + 4Q + 0.1Q^2$ (where F is a number bigger than zero), which means that their marginal cost is given by $4 + 0.2Q$. Their profit-maximizing choice of output is $Q^* = 10$.
   a) What is the price per unit of output in this industry? How do you know? Sketch a diagram to illustrate the two sides of the equation that you used to get your answer.

   b) For what values of F will this producer choose to shut down in the long run, and for which values of F will they choose to stay in business in the long run? Explain your answer. If F is in the 'shut down in the long run' range, how do we know that it's better in the short run for the producer to produce some output rather than none?

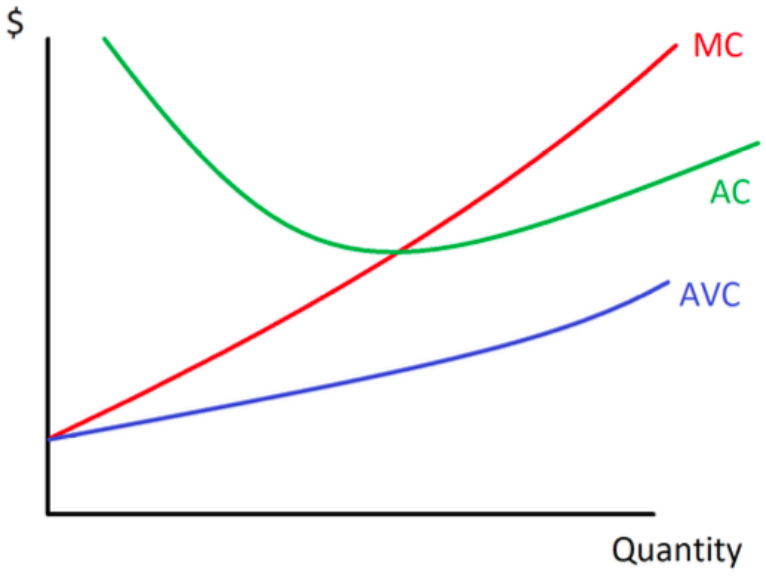
4) Consider a model of a profit-motivated producer in a perfectly competitive industry. The following diagram shows information about their costs and price:



a) Show on the diagram the producer's optimal choice of out- put. Explain why this is their optimal choice (including ex- plaining any jargon in simple language). Add to the diagram an area that represents the producer's profit. Is that profit positive or negative, and how do you know?

b) In the long run, what does the model of perfect competition predict will happen to the price and the number of producers in this industry? Explain why, with reference to the appropriate assumptions of the model.

5) The diagram below shows the cost structure (average cost, marginal cost, and average variable cost) for a representative firm whose product is sold in a perfectly competitive market. The market is currently in long run equilibrium.



a) Say that there is a technological innovation that reduces the fixed cost of production in this industry (and has no other effect on the market for this product). Add to the diagram to show how this will affect the cost structure for this firm. In a few sentences, explain in simple terms what your diagram shows, including a brief explanation of these various types of cost.

b) Explain what will happen in the long run in this industry and why (all else being equal). Sketch a supply and demand diagram to support your answer.