Problem Set #5

ECON 407: Mathematical Economics

(**due next class**)

1. For the following functions, (i) find the critical values and (ii) test to see if the critical values are a relative maximum, minimum, or neither.

a) $f\left(x\right)=-7x^{2}+126x-23$

b) $y=-(x-8)^{4}$

c) $f\left(x\right)=2x^{4}-16x^{3}+32x^{2}+5$

2. Find the optimal level of output, $Q^{\*}$, that maximizes profit, $π$, for a firm given total revenue $R=4000Q-33Q^{2}$ and total cost $C=2Q^{3}-3Q^{2}+400Q+5000$, assuming $Q>0$. What is the profit level at $Q^{\*}$?

3. A producer has the possibility of discriminating between the domestic and foreign markets for a product. That is, the producer can charge one price in the domestic market and a different price in the foreign market. The demand functions for the domestic and foreign markets, respectively, are

$$Q\_{1}=21-0.1P\_{1}$$

$$Q\_{2}=50-0.4P\_{2}$$

Total production costs across both markets are $2000+10Q$ where $Q=Q\_{1}+Q\_{2}$.

What price will the producer charge in order to maximize profits with discrimination between markets? What quantity will be sold in each market at this price? **Hint**: set marginal revenue (MR) equal to marginal cost (MC) in each market.