

1. (12 pts) Find the first derivative:  $f'(x)$  of the following functions:

a.  $f(x) = 16 + 100x^2 - 5/x$

b.  $f(x) = 8x^{-0.5} + 8x^{0.5}$

c.  $f(x) = (x^3 - 1)(2x + 5)$

d.  $f(x) = (6x - 2)/(x^2 + 1)$

2. (12 pts) For the function  $f(x) = 100 + 20x - x^2$

a. Find the  $x$  that maximizes the above function?

b. Prove that this  $x$  is a maximum point and not a minimum point

3. (12 pts) House Cleaners Inc. goal is to maximize (Q) the daily number of houses cleaned which is a function of labor (L) and capital (K). Specifically,  $Q = 4K^2 - 2K - KL + 2L^2 - 6L - 80$
- Find the first order conditions that maximizes Q
  - How much labor (L) and capital (K) will House Cleaners use to maximize Q? (Assume that House Cleaners can hire fractions of labor and capital).
4. (12 pts) Using words **and** a graph to illustrate the distinction between a “change in demand” and a “change in quantity demanded”.
5. (12 pts) The price elasticity of demand for chicken is  $-0.65$ . Interpret what this number means.

6. (12 pts) Find the equilibrium price and quantity in a market with the demand and supply curves:

$$Q^d = 6 - \frac{1}{2} P$$

$$Q^s = \frac{1}{4} P$$

7. (15 pts) Given the linear demand curve,  $Q = 100 - 5P$

a. Derive the inverse demand curve

b. What is the choke price?

c. What is the price elasticity of demand at  $P = \$5$ ?

8. (13 pts) Calculate the cross-price elasticity of demand of steak with respect to the price of chicken if the  $P_{\text{chicken}} = \$4$ ,  $P_{\text{steak}} = \$8$  and given the demand curve:  $Q^D_{\text{steak}} = 100 - 10P + 6P_{\text{chicken}}$