

Quiz #2 Univariate calculus: derivatives, ~~elasticity~~, curve sketching, and optimization.

Fall 2009 students will NOT have “elasticity” problems on Exam 2

There are 10 problems on 3 pages. (Problems on page 4 are “extra credit.”)

Define *italicized* terms for substantial partial credit. Show all your work, and draw a BOX around your final answer.

Derivate:

3pts 1) $y = \frac{x^2 + 3}{2}$

3pts 2) $y = \frac{1}{x^3}$

3pts 3) $f(x) = \sqrt[3]{x}$

4pts 4) $y = 27x + 18 - \frac{5}{x^2}$

4pts 5) $y = \frac{5(x-1)}{x^2}$

4 pts 6) $q = 2(p+1)^{-2} + 3$

4 pts 7) $y = \frac{8z}{(z+1)^{-1}}$

8) A firm's *Total Cost* of production can be summarized as $C(q) = \frac{q^2}{4} + 3q + 400$.

2pts a) How much are *Fixed Costs* for this firm?

3pts b) Express *Marginal Costs* for this firm:

3pts c) Express *Average Costs* for this firm:

5pts d) What is the level of output (q^*) at which this firm's *Average Costs* are minimized?

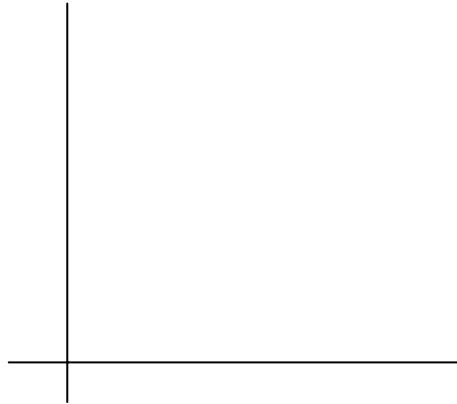
9) Given $q(p) = 4p^2 + 2p$

6pts a) Evaluate the *elasticity* of q at $p=1$

4pts b) Is $q(p)$ a *Demand* function or a *Supply* function? Why do you think so?

10) $Revenue = \$R(q) = 400q - 2q^2$
 $Cost = \$C(q) = 2q^2 + 4q + 400$

6pts a) What does the *Revenue* function look like? Using the axes below, sketch it.
For full credit you must solve for **and label** all the axes, *intercepts*, *critical points*, and so on.



3pts b) Express *Profit*:

3 pts c) Find the quantity (q^*) at which *Profit* is maximized.

3 pts d) How can you tell if q^* gives the maximum rather than the minimum profit?

EXTRA CREDIT (not to exceed 100% on the whole Quiz)

5pts I. ~~What is the price-elasticity of demand for the Demand function $Q(P) = 4P^{-1}$?~~

7pts II. The *inverse demand* function per customer is: $P = 15/Q$.

a) Express *Revenue* per customer

b) Sketch *Revenue* per customer

c) Sketch one customer's *Demand* curve (hint: it is called a *Linear Hyperbola*)

8pts III. Curve sketch $y = f(x) = b^2x^2 - x^4$ where b is a positive constant.