**Name** (Last, First):_____ **UIN:** _____ **TA:** _____
**Name** (Last, First):_____ **UIN:** _____ **TA:** _____
**Name** (Last, First):_____ **UIN:** _____ **TA:** _____
**Name** (Last, First):_____ **UIN:** _____ **TA:** _____

Extra Credit In Class Only (Att0229) Group Work February 29, 2008

**Math 165 Optimization Worksheet**

**Problem 3.4.17.** Price $p$ and demand $q$ are related by the equation $p = 49 - q$. The total cost of producing $q$ units is $C(q) = (1/8)q^2 + 4q + 200$

(a) revenue function $R(q) =?$

(b) profit function $P(q) =?$

(c) marginal revenue function $R'(q) =?$

(d) marginal cost $C'(q) =?$

(e) average cost $A(q) = (C(q)/q) =?$

(f) derivative of average cost $A'(q) =?$

(g) Find the $q$ for which $A(q)$ is minimized. For this $q$, compare the marginal cost $C'(q)$ and $A(q)$.

**Problem 3.4.22** Price $p$ and demand $q$ are related by the equation $p = 81 - 3q$. The total cost of producing $q$ units is $C(q) = (q + 1)/(q + 3)$

(a) revenue function $R(q) =?$

(b) profit function $P(q) =?$

(c) marginal revenue function $R'(q) =?$

(d) marginal cost $C'(q) =?$

(e) average cost $A(q) = (C(q)/q) =?$

(f) derivative of average cost $A'(q) =?$

(g) Find the $q$ for which $A(q)$ is minimized. For this $q$, compare the marginal cost $C'(q)$ and $A(q)$.

**Problem 3.4.39.** PRICE ELASTICITY OF DEMAND When a particular commodity is priced at $p$ dollars per unit, consumer demand $q$ units, where $p$ and $q$ are related by $q^2 + 3pq = 22$.

(a) Find the price elasticity of demand, $\frac{p}{q}\frac{dq}{dp}$, for this commodity. **Hint:** Use implicit differentiation wrt $p$.

(b) For a unit price of $p = \$3$, is the demand elastic, inelastic, or of unit elasticity? **Hint:** $q > 0$.

**Problem 3.5.5 variation:** LINEAR PRICE–DEMAND MODEL A store has been selling a popular computer game at the price of \$40 per unit, At this price, players have been buying 50 units per month. The owner of the store wishes to raise the price of the game and estimates that for each \$1 increase in price, 3 fewer units will be sold (**Hint:** $\frac{dq}{dp} = \ldots$). If each unit costs the store \$25, at what price $p$ should the game be sold to maximize profit?

(a) In this problem, express the profit function as a quadratic function of $p$.

(b) Use differentiation wrt $p$ to find the critical number ($p = \ldots$) of the profit function.

(c) The graph of the profit function is a parabola. Where is the vertex of the parabola?

**Problem 3.5.10.** There are 320 yards of fencing available to enclose a rectangular field. How should this fencing be used so that the enclosed area is maximized? What is the shape of the *optimal field*?