

Workshop #5 (October 23rd, 2008)

Use Maple to solve the following problems. Please turn in a copy of your Maple calculations and plots along with your answers.

1. Sports-O-Rama sells autographed World Series baseballs. They have found that if they set the price at \$30 a ball they will sell only 10 balls. On the other hand, if they drop their price to \$10 per ball, they will sell 25 balls. In addition, Sports-O-Rama has modeled the costs (incurred selling these balls) using the following function: $C(q) = (1/4)q^2 - 5q + 35$.
 - (a) Determine the demand function for these collectable baseballs.
 - (b) Find Sports-O-Rama's collectable baseball revenue function.
 - (c) Find their profit function.
 - (d) Use Maple to plot the Revenue, Cost, and Profit functions (together).
 - (e) Find their **ideal** maximum revenue, minimum cost, and maximum profit.
By ideal I mean – don't use decimal approximations.
 - (f) Discuss their **actual** maximum revenue, minimum cost, and maximum profit.
By actual I mean – take into account that you can sell 1 ball or 2 balls but not 1.2 balls.

2. Recall that average annual costs are modeled by $A(t) = \frac{M}{t} + Rt^r$ where M is the replacement cost of the item, R is the average repair costs for the first year, and r is a repair cost growth rate.

John needs a new car. He is interested in buying a Fjord Malcontent. A 2009 Malcontent costs \$25,000. Suppose that this car has average (estimated) repair costs of \$100 for the first year and \$515 for the second year.

- (a) Use maple to find the annual repair cost growth rate r .
Hint: If $f(t) = Rt^r$, we need $f(1) = 100$ and $f(2) = 515$.
- (b) Find John's average annual cost function, $A(t)$, for his Malcontent.
- (c) Plot $A(t)$ — Note: choose a range for t which gives a nice looking plot.
- (d) If John wants to minimize his annual costs, how long should he keep this car? What will his average annual costs be?