Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Modeling Functions

Linear and Quadratic

Breakout session #3

**Time to crank out some modeling problems!!**

1. Suppose you own a car that is 40 months old. From an automobile dealer’s “Blue Book” you find that its trade-in value is $3200. From an old Blue Book you find that its trade-in value 10 months ago was $4700.

A. Write a function expressing trade-in value as a function of the cars age in months.

B. You plan to get rid of the car when its trade-in value drops to $1000. How much longer should you keep the car?

C. What does the slope of your function represent in the real world? Why is it negative?

D. When do you predict that car will be worthless? How do you know this?

E. According to your model, what was the trade-in value of the car when it was new?

2. Ferster’s RENT A WRECK will rent you a fine automobile for $25 plus $0.15 per mile traveled.

A. Write a function expressing the cost to rent an auto from Ferster’s as a function of the number of miles driven.

B. Find the cost of renting a car to travel 1200 miles.

C. What does the slope of your function represent in the real world?

D. What does the y-intercept represent in the real world?

E. How many miles did you have drive if your rental bill was $61?

3. A farmer wants to fence in a rectangular region using one side of a building as one side and 300 feet of fencing for the other three sides. The side along the building will not be fenced. Find the dimensions of the fenced-in region that will give the greatest area.

A sketch to help us.



A. We seek to represent the area of the rectangle. How could we write it in terms of 2 variables, x and y?

B. Now, let’s try to get our function (dealing with area) to be represented in terms of x (in other word, how can we get rid of y?). HINT: We’ll need to use the 300.

C. So, what’s the function for Area, dependent on the length of x?

D. Now, let’s find the value of x that maximizes the area. We’ll need to locate the vertex of our quadratic function.

E. Finally, what dimensions for the rectangle generate the largest area?

3. Have Fun Travel Agency is proposing a tour in which a group will travel in a plane that has a capacity of 150 people. The fare for the tour will be $1400 per person if 120 or fewer people go on the tour. The fare per person for the entire group will be DECREASED by $10 for EACH PERSON in excess of 120. For instance, if 125 people go, the fare for each will be $1350 ($1400 – 5($10)). Let x represent the number of people who go on the tour, and T be the total revenue for Have Fun Travel Agency (in dollars).

A. We want to express T as a function of x. How might we proceed? What should x represent?

B. What value of x will give a MAXIMUM TOTAL REVENUE?

C. What is the MAXIMUM REVENUE?

4. Del’s Discount Tie Emporium sells Philadelphia Eagles ties. Now, probably due to the Eagle’s dreary performance so far this season, sales of these ties have been lagging. Eagles ties are currently priced at $14, and have been selling at a rate of 2 ties per day. Del’s business consultant has determined that for each dollar that he reduces the price of an Eagles tie, an additional tie will be sold.

A. Write an expression in terms of x for the cost of a tie after its price is reduced by $x

B. Write an expression in terms of x for the number of ties sold per day after the price is reduced by $x.

C. Write an expression in x for the sales revenue per day after reducing the price by $x.

D. What price reduction will maximize the sales revenue on the Eagles ties?

E. What is the maximum revenue amount?