Unit 4-1-1 Activity Draft

**4-1-1 Algebra of functions, Creating new functions**

As in 1150, given graphs (or tables?) of two functions, find points of combos of those functions.

For complicated forms, find the order of steps when plugging in x. Begin to get “birds eye view” of the structure of a function.

Oil-Rig (or path to ice-cream stand) with water/land: Comb in adding functions (time = d/r)). Good domain question.

2167 Activity: A rectangular storage container with an open top has a volume of 9 cubic meters. The length of the base is twice its width. Material for the base costs $10 per square meter while material for the sides costs $6 per square meter. Express the cost of the materials as a function of the width of the base.

Truck mpg problem from 1151: (Optimization HW #15): A shipping company is trying to minimize the cost of driving a truck between Chicago and New Orleans. They know the following things:

* The trip is 750 miles.
* Running at 50 mph, the truck gets 4 miles per gallon.
* For each 1 mph increase in speed above 50 mph the truck loses 1/10 of a mile per gallon in fuel efficiency, and for each 1 mph decrease in speed below 50 mph the truck gains 1/10 of a mile per gallon in fuel efficiency.
* The team of drivers earns 27 dollars per hour.
* There is an additional cost of 15 dollars per hour to operate the truck.
* Diesel fuel for the truck costs $3.90 per gallon.
* The truck will be driven at a constant speed for the entirety of the trip.

Write a cost function, C(x), for the total cost of driving the truck from Chicago to New Orleans at the **constant** speed xTop of Form

. The domain of this cost function is \_\_\_\_\_\_\_\_ miles per hour.

FM: 4.3: Given graphs of f, g, find specific combo points. Graph those combo functions. (Many are composition: For 5-3)

Also FM: 5.1: Operations on Polynomials. Includes multiplying and factoring. Volume of fold-up box. Also: Volume of planter: You are designing several marble planters for a city park. You want the length of the planter to be 1 foot longer than the width, and the height to be the same as the width (the picture is not to scale). The sides should be one foot thick. Because the planter will be on the sidewalk, it does not need a bottom. Write volume as function of width.

S-Z: p. 85 (Also several f, g formula examples): In Exercises 46 - 50, C(x) denotes the cost to produce x items and p(x) denotes the price-demand function in the given economic scenario. In each Exercise, do the following: Find and interpret C(0). Find and interpret C(10). Find and interpret p(5) Find and simplify R(x). Find and simplify P(x). Solve P(x) = 0 and interpret.

S-Z: p. 239: fold-up box

S-Z: p. 247: #32. While developing their newest game, Sasquatch Attack!, the makers of the PortaBoy (from Example 2.1.5) revised their cost function and now use C(x) = .03x 3 − 4.5x 2 + 225x + 250, for x ≥ 0. As before, C(x) is the cost to make x PortaBoy Game Systems. Market research indicates that the demand function p(x) = −1.5x + 250 remains unchanged. Use a graphing utility to find the production level x that maximizes the profit made by producing and selling x PortaBoy game systems.

S-Z p. 247: #33. According to US Postal regulations, a rectangular shipping box must satisfy the inequality “Length + Girth ≤ 130 inches” for Parcel Post and “Length + Girth ≤ 108 inches” for other services. Let’s assume we have a closed rectangular box with a square face of side length x as drawn below. The length is the longest side and is clearly labeled. The girth is the distance around the box in the other two dimensions so in our case it is the sum of the four sides of the square, 4x. (a) Assuming that we’ll be mailing a box via Parcel Post where Length + Girth = 130 inches, express the length of the box in terms of x and then express the volume V of the box in terms of x. (b) Find the dimensions of the box of maximum volume that can be shipped via Parcel Post.

Active Reading 8.1.3: : For your business, you buy a certain type of item from the manufacturer, and then you sell it to your customers at a mark-up. That is, you sell it for more than you bought it.

You are concerned with the following functions regarding this item.

* In month t, the function c(t) represents your cost to buy one of the items.
* In month t, the function p(t) represents the price you sell the item for.
* In month t, the function q(t) represents the total quantity of the items you sell that month.

Which function combination represents the total amount your customers paid you for all the items you sell?

Active Reading: 8.1.4: The graph shows two new functions y=f(x) and y=g(x). Our goal is to create the product of these functions:

P(x)=f(x)g(x)

Use the graph to complete the table of values for the functions f(x), g(x) and P(x)

|  |  |  |  |
| --- | --- | --- | --- |
| x | f(x) | g(x) | P(x)=f(x)g(x) |
| -4 | -3 | 3 |  |
| 0 | -1 | 2 |  |
| 2 | 0 | 1.5 |  |
| 4 | 1 | 1 |  |
| 6 | 2 | 0.5 |  |
| 8 | 3 | 0 |  |

Then in 8.1.5: Gives formulas for the lines: Find formula of product.

Active Reading 8.2: Several of find combos at points from formulas, graphs, tables.

APC: p. 280 #3: An open triangular trough, as pictured in Figure 5.3.6 is being constructed from aluminum. The trough is to have equilateral triangular ends of side length s and a length of l. We want the trough to used a fixed 100 square feet of aluminum. Figure 5.3.6: A triangular trough. a. What is the area of one of the equilateral triangle ends as a function of s? b. Recall that for an object with constant cross-sectional area, its volume is the area of one of those cross-sections times its height (or length). Hence determine a formula for the volume of the trough that depends on s and l. c. Find a formula involving s and l for the surface area of the trough. d. Use the constraint that we have 100 square feet of available aluminum to generate an equation that connects s and l and hence solve for l in terms of s. e. Use your work in (d) and (b) to express the volume of the trough, V, as a function of l only. f. What is the domain of the function V in the context of the situation being modeled? Why?

Calc-Medic: 1.6: The Student Council is involved in helping plan prom. They have to find vendors, budget costs, and sell tickets. They need to break even on their costs, but they’re not looking to make a profit. The cost of renting a space for up to 400 people is a $700 flat fee. The cost of catering a dinner for x attendees is given by C(x) = 300 + 32x. Write an equation for the total cost, T(x), of putting on a prom if these are the only two expenses. 2. What is the domain of �(�)? How do you know? 3. The 12 student council members are all required to attend the prom, but they don’t have to pay for a ticket. a. Write an equation, N(x) that gives the number of paying attendees if x students attend the prom. b. Is it possible for the number of attendees at prom to be 11? What about 12? 20? What is a reasonable domain for �(�) in this situation? 4. Write the expression for T(x)/N(x) and explain what this means in the context of this problem. 5. What is the domain of this new function? How does this answer compare to your answer in 3b? 6. The Student Council wants to sell tickets for $40. How many total attendees do they think will come to the prom?

Calc-Medic: 1.6: 1. The number of customers at Pumpkin Pi Bakery depends on the price of the pie. Market research says that the number of customers can be estimated by �(�) = 110 − 4.4�, where p is the price of a pie. a. If the bakery charges $10 per pie, how many customers will there be? How much money (revenue) will Pumkin Pi Bakery make at that price? (Assume each customer buys only one pie) b. Write an equation for the revenue Pumpkin Pi Bakery will make when they charge p dollars per pie. What is a reasonable domain for this function?

2. The graph of �(�) is shown below and a table of selected values is given for �(�), a function defined for all real numbers. a. Let ℎ(�) = �(�)�(�). Find ℎ(0). b. What is the domain of ℎ(�)? c. Find all x-values such that ℎ(�) = 0.

3. Let �(�) = √10 − � and �(�) = 8� + 7. a. Find �(�) − �(�). What is the domain of this function? b. Find &(#) '(#) . What is the domain of this function?