

NAME: _____

Math 103L: Exercise on Functions (Section 2.1)

These problems are a sample of the kinds of problems that may appear on the final exam. Some answers are included to indicate what is expected. Problems that require a summary statement are marked with Sum. The summary statements should be written in complete sentences and they should include the units of measurement for all quantities mentioned in the summary.

Function Interpretation:

1. (Worked Example: READ IT!) Sum The monthly demand $D(p)$ for StarBoys Frapaccino is function of the price p of a serving. The price p is measured in dollars and the demand $D(p)$ is measured in thousands of servings per month.

- (a) Translate the symbols $D(2.40) = 171$ into words.

Answer:

At a price of \$2.40 per serving the monthly demand for frapaccini will be 171 thousand servings per month. That is, 171,000 servings per month.

- (b) StarBoys management wants to know what price they should charge in order to sell 200,000 servings monthly. Translate this problem into symbolic form.

Answer:

Solve for p in $D(p) = 200$.

2. Clippo Inc. manufactures and sells paper clips. The revenue $R(x)$ from the sales of paper clips is a function of how many x they sell. The number sold, x , is measured in thousands of papers clips. The revenue, $R(x)$, is measured in dollars.

- (a) Sum Write a summary in words for the statement $R(204) = 890$.

- (b) Clippo management wants to know how many paper clips they must sell to get \$14,000 in revenue. Translate this problem into symbolic form.

Evaluating functions with algebraic expressions

3. Let

$$f(x) = x^2 - 3x.$$

Evaluate and simplify

(a) $f(2) = (2)^2 - 3(2) =$

(b) $f(-2)$

(c) $f(a)$

(d) $f(a + 1)$

(e) $f(a + 1) - f(a)$

4. Let $f(x) = 2x^2$. Evaluate and simplify the expression

$$f(3+h) - f(3).$$

5. Write the domain of the function $f(x) = \sqrt{x-5}$ in interval notation.

Business Models: Cost, Revenue, Profit, Demand.

6. The cost to produce x bookends is

$$C(x) = 350 + 3x,$$

where $C(x)$ is given in dollars.

- Sum Evaluate and interpret $C(10)$.
- Sum Write a summary for the statement $C(40) = 470$.
- Sum What is the cost of producing the 11th bookend?

7. A music company sells CDs for a particular artist. The company has advertising costs of \$4000 and recording costs of \$10,000. Their cost for manufacturing, royalties, and distribution are \$5.50 per CD. They sell the CDs to Mage-Mart for \$7.20 each.

- (a) Sum What are the fixed costs?
- (b) Sum What are the variable costs?
- (c) What is the equation for the cost function for x CDs?
 $C(x) =$
- (d) What is the equation for the revenue function?
 $R(x) =$
- (e) Sum How many CDs must the company sell to break even? (Just set it up.)

8. The price-demand equation for gasoline is

$$0.2x + 5p = 80,$$

where p is the price per gallon and x is the daily demand measured in millions of gallons.

a. Write the demand $f(p)$ as a function of price.

$f(p) =$

b. What is the demand if the price is \$4.00 per gallon? Use the correct units to express your answer.

9. The cost to produce x memory chips is

$$C(x) = 800 + 5.25x,$$

where cost is measured in dollars.

- (a) Sum What is the cost to produce 100 memory chips?
- (b) Sum What is the average cost (per chip) to produce 100 memory chips?
- (c) Sum Write a formula for the average cost (per chip) $\bar{C}(x)$ to produce x memory chips.

Piecewise linear functions

10. The Trussville Utilities uses the rates shown in the table below to compute the monthly cost, $C(x)$, of natural gas for residential customers. Usage, x , is measure in hundred cubic feet (HCF) of natural gas.

Base charge \$8.00

First 1000 CCF \$0.04 per HCF

Over 1000CCF \$0.07 per HCF

- a. Find the charge for using 250 HCF.
- b. Find the charge for using 1200 HCF.
- c. Find an expression for the cost function $C(x)$ for usage under 1000 CCF.
- d. Find an expression for the cost function $C(x)$ for usage over 1000 CCF.