Math 95, HW 1 Section 2.1 Function Introduction Name: _____

Concepts and Vocabulary:

1. The notation $y = f(x)$ is called _____ notation.

3. The notation $f(x) = x^2 + 1$ is a _____ representation of a function.

5. The set of valid inputs for a function is the _____.

7. A function computes _____ output for each valid input.

9. Name four types of representations for a function.

11. If $f(a) = b$, the point _____ is on the graph of f.

13. If a is in the domain of f, then $f(a)$ represents how many outputs?

In exercises 15 - 19 odd, determine whether the phrase describes a function.

15. Calculating the square of a number

17. Listing the students who passed a given math exam

19. Finding sales tax on a purchase

Representing and Evaluating Functions:

For exercises 21 - 31 odd, evaluate $f(x)$ at the given values of x.

21. $f(x) = 4x - 2$ $\quad x = -1, 0$

23. $f(x) = \sqrt{x}$ $\quad x = 0, \dfrac{9}{4}$

25. $f(x) = x^2$ $\quad x = -5, \frac{3}{2}$

27. $f(x) = 3$ $\quad x = -8, \frac{7}{3}$

29. $f(x) = 5 - x^3$ $\quad x = -2, 3$

31. $f(x) = \frac{2}{x+1}$ $\quad x = -5, 4$

33. Function I computes the number of inches in x yards.

    a. Write a formula for the function described.

    b. Evaluate the function for input 10 and interpret the results.

34. Function A computes the area of a circle with radius r.

    a. Write a formula for the function described.

    b. Evaluate the function for input 10 and interpret the results.

For exercise 39 and 41, write the function f as a set of ordered pairs. Give the domain and range of f.

39. $f(1) = 3$, $f(2) = -4$, $f(3) = 0$

41. $f(a) = b$, $f(c) = d$, $f(e) = a$, $f(d) = b$

For exercises 63 and 65, express the verbal representation for the function f numerically, symbolically, and graphically. Let $x = -3, -2, -1, ..., 3$ for the numerical representation (table), and let $-3 \leq x \leq 3$ for the graph.

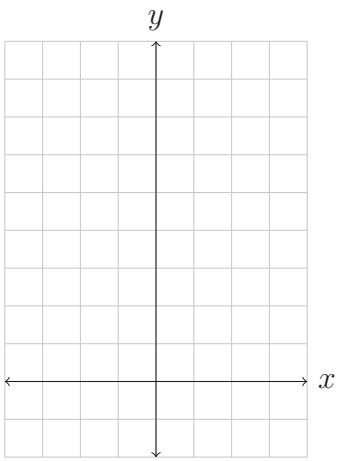
63. Add 5 to the input x to obtain the output y.

a. Numerically

x	$y = f(x)$

b. Symbolically

c. Graphically



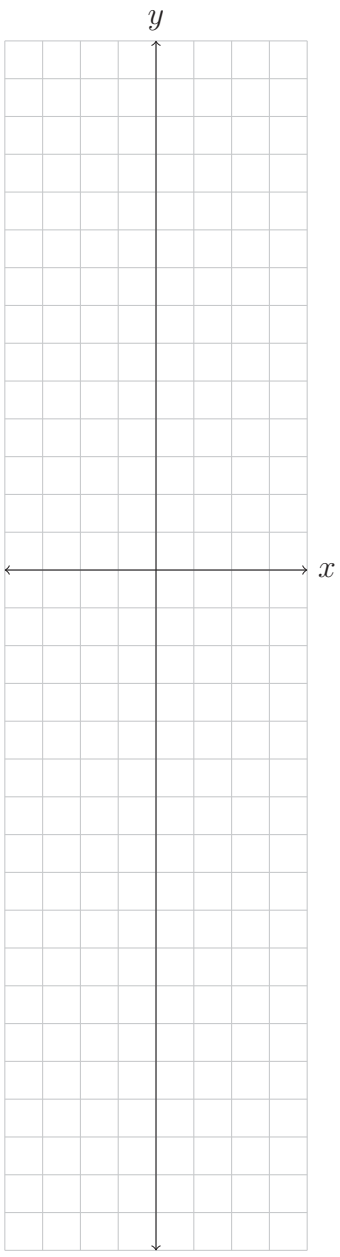
65. Multiply the input x by 5 and then subtract 2 to obtain the output y.

a. Numerically

x	$y = f(x)$

b. Symbolically

c. Graphically



Identifying Domains and Ranges:

For exercises 81 - 89, use the graph or diagram in the text on page 87 to estimate the domain and range of the expressed function. Use proper set notation.

81. Domain = Range =

83. Domain = Range =

85. Domain = Range =

87. Domain = Range =

Identifying a Function:

In exercises 109 and 111, determine if the diagram on page 88 represents a function. Give an explanation of why it is or is not a function.

109. 111.

For exercises 115 - 129 odd, determine whether the graph, set of points or table from the book on pages 88 and 89 represent functions. If it does, identify the domain and range using proper set notation.

115. 121.

117. 123.

119.

S1. Determine whether one quantity is a function of another within real life contexts by applying the definition of a function. Give your interpretation of the situation if you feel the description is vague.

a. Is height a function of age?

b. Is age a function of height?

c. Is name a function of G# (i.e, PCC ID number)?

d. Is G# a function of name?

e. Is the cost per person a function of the number of people sharing a $20 pizza?

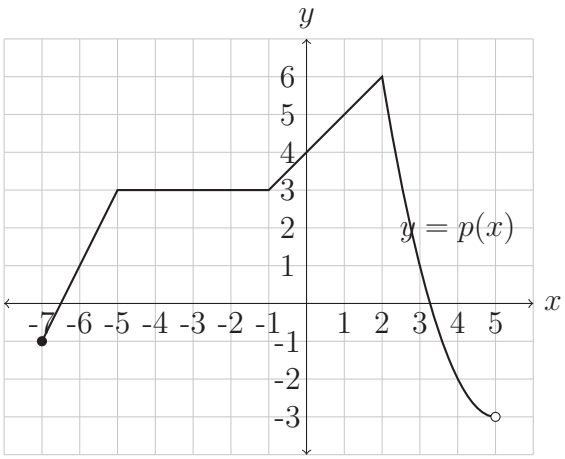
S2. The value of a computer, in dollars, is given by $c(t) = 600 - 150t$, where t is the number of years since the computer was purchased.

a. Find and interpret the vertical intercept of the function c.

b. Find and interpret the horizontal intercept of the function c.

c. Find the domain and range of c. State it using interval notation.

S3. The function $y = p(x)$ is graphed in the below figure. Use it to determine the following values.



a. Find $p(0)$.

b. Find $p(1.5)$.

c. Find $p(5)$.

d. Find $p(-7)$.

e. Find $p(2)$.

f. Solve $p(x) = -2$.

g. Solve $p(x) = 1$.

h. Solve $p(x) = -4$.

i. Solve $p(x) = 3$.

j. Solve $p(x) = 0$.

k. State the domain of p in interval notaion.

l. State the range of p in interval notation.

m. Find all x for which $p(x) > 1$.

S4. A group of rafters take a 15 day rafting trip down the Colorado River through the Grand Canyon. The distance, in miles, $K(t)$, that the group has floated is a function of the number of days traveled, t. The table below gives some data about the trip.

t	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$K(t)$	0	20	35	45	58	75	100	125	135	145	158	175	211	230	258	277

a. Find and interpret $K(8)$.

b. Find and interpret $K(35)$.

c. Solve $K(t) = 125$ and interpret your answer.

d. Find the average rate of change between $t = 11$ and $t = 13$. Explain your answer

e. Find and interpret the vertical intercept of the function K.

f. What is the domain of the function K? Explain your answer.

g. What is the range of the function K? Explain your answer.

S5. The historic Arlene Schnitzer Concert Hall originally opened in 1928 as the Portland Publix Theatre. The Theatre seated 2776 people and it cost 60 cents per ticket. Let $r(x)$ be the revenue, in dollars, from selling x tickets for an event at the Theatre.

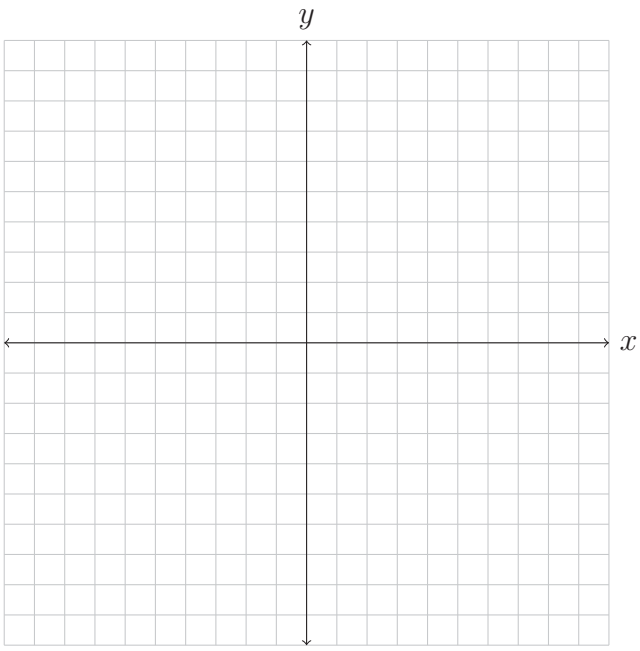
a. Find the algebraic formula for $r(x)$.

b. Find the domain and range of r. Explain your answer.

S6. Consider the linear function $f(x) = 4 - 0.5x$.

a. Find and simplify the expressions for $y = f(x + 6)$ and $y = f(x) + 6$.

b. Graph $y = f(x)$, $y = f(x + 6)$, and $y = f(x) + 6$ on the same set of coordinate axes.



S7. If $p(x) = x^2$, find and simplify expressions for $p(x + 2)$ and $p(x) + 2$. Are the resulting expressions equivalent?

S8. Let $j(x) = 4 - t + 2t^2$. Find and simplify the following expressions.

a. $j(3t)$

c. $3j(t)$

b. $j(3 - t)$

d. $3 - j(t)$

S9. Suppse that $y = g(x)$ is a linear function and that $g(0) = -150$ and $g(50) = 2000$. Find the algebraic formula for $g(x)$.

S10. Suppose that $y = h(x)$ is a linear function and that $h(-5) = 2$ and $h(5) = 20$. Find an algebraic formula for $h(x)$.

S11. Suppose that $y = j(t)$ is a linear function and that $j(-6) = 5$ and $j(10) = -1$. Find an algebraic formula for $j(t)$.

Solutions to Supplemental Questions.

S1. a. Answers may vary. You could answer, "Yes," since, at a particular time, you can only be one height. Or you could answer, "No," since, during a given year, you can grow and thus be more than one height at that age.

b. No. You can be the same height for many years.

c. Yes. Each G# is associated with only one name.

d. No. There can be more than one person with the same name attending PCC, so there can be more than one G# associated with a particular name.

e. Yes, if you split the cost evenly. The cost per person, c, can be a function of the number of people splitting the pizza, n, given by $c = f(n) = \frac{2}{n}$. For each positive integer number, n, the cost c will be unique.

S2. a. The point $(0, 600)$ is the vertical intercept. It means that when the computer is brand new, it is worth \$600.

b. The point $(4, 0)$ is the horizontal intercept. It means that when the computer is 4 years old, it is worth nothing.

c. The domain is $[0, 4]$. The range is $[0, 600]$.

S3. a. $p(0) = 4$

b. $p(1.5) = 5.5$

c. $p(5)$ is undefined.

d. $p(-7) = -1$

e. $p(2) = 6$

f. The solution set is $\{4\}$.

g. The solutions set is $\{-6, 3\}$.

h. The are no solutions. The solution set is $\{\}$.

i. The solution set is $\{x| -5 \leq x \leq -1 \text{ or } x \approx 2.5\}$.

j. The solution set is $\{x|x \approx -6.5 \text{ or } x \approx 3.2\}$.

k. The domain is $[-7, 5)$.

l. The range is $(-3, 6]$.

m. $p(x) > 1$ for all x in the set $\{x| -6 < x < 3\}$.

S4. a. $K(8) = 135$. After 8 days of rafting, the group has floated 135 miles down the Colorado River.

b. $K(35)$ is undefined. The rafting trip was finished after 15 days, so the group was no longer rafting 35 days after starting the trip.

c. The solution to $K(t) = 125$ is $t = 7$ since the group has floated down 125 miles of the Colorado River 7 days after starting the trip.

d. The average rate of change is 27.5 miles per day. This means that each day between days 11 and 13 the rafting group traveled an average of 27.5 miles.

e. The vertical intercept is $(0, 0)$, so the vertical and horizontal intercepts are the same. This point means that after 0 days of rafting, the group had floated 0 miles down the Colorado River.

f. The domain is $[0, 15]$. The input values for this function represent the number of days of the rafting trip and the trip was 15 days long, so all time periods between and including 0 and 15 days must be in the domain.

g. The range is $[0, 277]$. The rafters floated all 277 miles of the Grand Canyon so at some moment during the 15 day trip, the rafters had floated each unique distance between and including 0 and 277 miles, so all of these values must be in the range.

S5. a. $r(x) = 0.6x$

b. Domain: $\{0, 1, 2, ..., 2775, 2776\}$
Range:
$\{0.00, 0.60, 1.20, 1.80, ..., 1664.40, 1665.00, 1665.60\}$

S6. a. $y = f(x + 6) = 1 - 0.5x$ and
$y = f(x) + 6 = 10 - 0.5x$

b. Check your graph by graphing these functions on your graphing calculator.

S7. $p(x + 2) = x^2 + 4x + 4$ while
$p(x) + 2 = x^2 + 2$ which are not equal.

S8. a. $j(3t) = 18t^2 - 3t + 4$

b. $j(3 - t) = 2t^2 - 11t + 19$

c. $3j(t) = 6t^2 - 3t + 12$

d. $3 - j(t) = -2t^2 + t - 1$

S9. $g(x) = 43x - 150$

S10. $h(x) = \frac{9}{5}x + 11$

S11. $j(t) = -\frac{3}{8}t + \frac{11}{4}$