

## Handout 6 (2.1-2.2 Functions)

1. Does each of the following situations represent a function? In each case, explain.

- a. Domain: Washington State Driver's License numbers Range: Dates of birth
- b. Domain: Washington State Driver's License numbers Range: Model(s) of car owned

2. Suppose  $p(a)$  represents the amount of paint needed, in gallons, to paint a house as a function of the square footage (area of the floor) of the house, in  $ft^2$ .

- a. Identify the input and output for this function.
- b. Interpret the statement  $p(1000) = 12$ . Your interpretation should include values and units.

3. Let  $r(s) = \frac{s}{s+6}$ . Find and simplify each of the following.

- |                |             |                  |
|----------------|-------------|------------------|
| a. $r(3)$      | d. $r(6)$   | g. $r(t)$        |
| b. $r(-3)$     | e. $r(-6)$  | h. $r(-t)$       |
| c. $r(3^{-1})$ | f. $r(0.6)$ | i. $r(t^{-1})$   |
|                |             | j. $[r(t)]^{-1}$ |

4. Let  $k(x) = 2^x + 1$

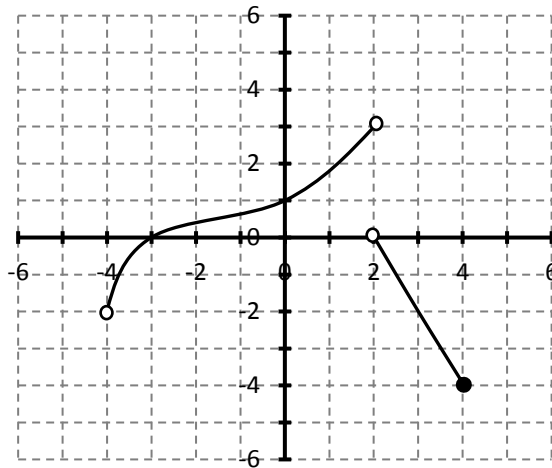
- a. Find
  - i.  $k(2)$
  - ii.  $k(-1)$ .
- b. Write and simplify an expression for  $2k(x)$ .
- c. Solve the following equations for  $x$ .
  - i.  $k(x) = 17$
  - ii.  $2k(x) - 6 = 12$

5. Let  $m(a) = 2a$  and  $n(a) = a^3$ . Express each of the following as a variation of  $m$  or  $n$ . (There may be more than one way.) Example: If  $y = z^6$ , then  $y = [n(z)]^2$ .

- |                        |                         |
|------------------------|-------------------------|
| a. $y = 2a + 6$        | d. $y = x^3 + 2x$       |
| b. $r = (t + 1)^3$     | e. $p = 4q^2$           |
| c. $y = \frac{1}{a^3}$ | f. $y = \frac{1}{8}a^3$ |

6. Let  $g(t) = t^2 - 1$ . Find
- |                                |                            |                    |
|--------------------------------|----------------------------|--------------------|
| a. $g\left(\frac{3}{2}\right)$ | b. $g(-x)$                 | c. $g(2+h) - g(2)$ |
| d. $\frac{g(2+h)-g(2)}{h}$     | e. $\frac{g(a+h)-g(a)}{h}$ |                    |

7. The entire graph of  $f(x)$  is shown below.



- a. Evaluate the following: i.  $f(3)$     ii.  $f(0)$     iii.  $f(-3)$     iv.  $f(2)$     v.  $f(3) - f(-3)$   
vi.  $f(4) - 2f(3)$     vii.  $2f(-3) - 3$     viii.  $f(0) - f(-3)$     ix.  $\frac{f(0) - f(-3)}{0 - (-3)}$   
b. For what values of  $x$  is  $f(x) = 3$ ?  
c. For what values of  $x$  is  $f(x) = -3$ ?

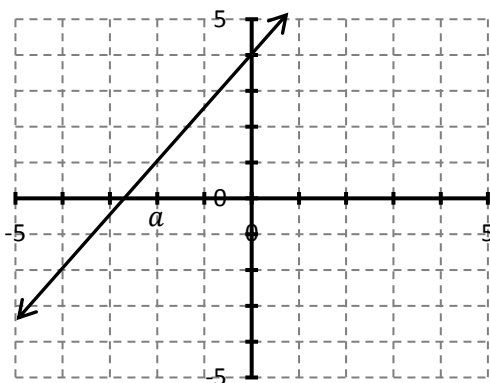
8. The function  $g(t)$  is defined by the table below.

$t$	-5	-3	0	1	3	5	7
$g(t)$	4	-1	-3	0	7	1	3

- a. Evaluate the following: i.  $g(0)$     ii.  $g(3)$     iii.  $g(-7)$     iv.  $4g(0)$     v.  $g(-5) - g(0)$   
b. For what value(s) of  $t$  is  $g(t) = 0$ ?  
c. For what value(s) of  $t$  is  $g(t) = 7$ ?

9. Sketch a graph which has the following characteristics: it is decreasing for  $-5 < x < -1$ , constant for  $-1 < x < 2$ , increasing for  $x > 2$ , and discontinuous at  $x = 4$ .

10. a. Consider the graph of  $k(x)$  below, does  $k(0) = 4$  represent the length of a line, an area, a slope, a point, or what?
- b. On the graph of  $k(x)$  below, indicate what  $k(a+2) - k(a)$  represents. Is this a point, the length of a line, an area, a slope, or what?
- c. What does  $\frac{k(a+2) - k(a)}{2}$  represent, a point, the length of a line, an area, a slope, or what?



11. Use your graphing calculator to graph  $y = x^3 - 2x + 1$  for each of the following viewing windows. Write a sentence or two describing what aspect of the graph you can see with each window.

- |    |  |    |  |    |  |
|----|--|----|--|----|--|
| a. | xmin -10<br>xmax 10<br>ymin -10<br>ymax 10         | b. | xmin 0<br>xmax 3<br>ymin -1<br>ymax 1        | c. | xmin -10<br>xmax 10<br>ymin -1000<br>ymax 1000 |
| d. | xmin -1000<br>xmax 1000<br>ymin -1000<br>ymax 1000 | e. | xmin -20<br>xmax 20<br>ymin -500<br>ymax 500 |    |  |

12. Use your graphing calculator to graph  $y = \frac{3x^2 + 5x}{x+12}$  for each of the following viewing windows. Write a sentence or two describing what aspect of the graph you can see with each window.

- |    |  |    |  |    |  |    |  |
|----|--|----|--|----|--|----|--|
| a. | xmin -10<br>xmax 10<br>ymin -10<br>ymax 10 | b. | xmin -20<br>xmax 20<br>ymin -10<br>ymax 10 | c. | xmin -50<br>xmax 50<br>ymin -300<br>ymax 300 | d. | xmin -700<br>xmax 700<br>ymin -2000<br>ymax 2000 |
|----|--|----|--|----|--|----|--|

13. From 1960 to 1990, the average annual per capita consumption  $C$  of cigarettes by Americans (18 and older) can be modeled by  $C(t) = 4024.5 + 51.4t - 3.1t^2$ , where  $t$  is the year, with  $t = 0$  corresponding to 1960. (Source: US Center for Disease Control)

- a. Interpret (explain in words) what  $C(10)$  represents with regard to this application.
- b. Beginning in 1966, all cigarette packages were required by law to carry a health warning. Do you think the warning had any effect? Explain.
- c. In 1960, the US had a population (18 and older) of 116,530,000. Of those, about 48,500,000 were smokers. What was the average annual cigarette consumption *per smoker* in 1960? What was the average daily cigarette consumption *per smoker*?