# Lesson 1 Practice Problems

## Section 1.1:  What is a Function?

1. The table below gives the distance D, in kilometers, of a GPS satellite from Earth $t$ minutes after being launched.

| $t$ = Time (in minutes) | $D$ = Distance (in km) |
|:---:|:---:|
| 0 | 0 |
| 20 | 4003 |
| 40 | 9452 |
| 60 | 14,232 |
| 80 | 18,700 |
| 100 | 20,200 |
| 120 | 20,200 |

a) Identify the input quantity (include units)._____

Identify the input variable._____

Identify the output quantity (include units)._____

Identify the output variable._____

b) Write the data as a set of ordered pairs.

c) Interpret the meaning of the ordered pair (40, 9452).

d) Is distance of the satellite a function of time? Why or why not?

e) Is time a function of the distance of the satellite from Earth? Why or why not?

2. The table below gives the number of Gene copies, $G$, $t$ minutes after observation.

| $t$ = Time (in minutes) | $G$ = number of Gene Copies |
|---|---|
| 0 | 52 |
| 3 | 104 |
| 5 | 165 |
| 6 | 208 |
| 8 | 330 |
| 10 | 524 |
| 12 | 832 |

a) Identify the input quantity (include units)._____

Identify the input variable._____

Identify the output quantity (include units)._____

Identify the output variable._____

b) Write the data as a set of ordered pairs.

c) Interpret the meaning of the ordered pair (6, 208).

d) Is the number of Gene copies a function of time? Why or why not?

e) Is time a function of the number of Gene copies? Why or why not?

3. The table below gives the number of homework problems, $H$, that Tara has completed $t$ minutes after she began her homework.

| $t$ = Time (in minutes) | $H$ = number of homework problems completed |
|---|---|
| 0 | 0 |
| 10 | 3 |
| 20 | 8 |
| 30 | 8 |
| 40 | 15 |
| 50 | 17 |
| 60 | 20 |

a) Identify the input quantity (include units)._____

   Identify the input variable._____

   Identify the output quantity (include units)._____

   Identify the output variable._____

b) Write the data as a set of ordered pairs.

c) Interpret the meaning of the ordered pair (40, 15).

d) Is the number of homework problems completed a function of time? Why or why not?

e) Is time a function of the number of homework problems completed? Why or why not?

4.  The table below gives the number of hot dogs, $H$, that a competitive hot dog eater has eaten $t$ minutes after the start of the competition.

| $t =$ Time (in minutes) | $H =$ number of hotdogs eaten |
|---|---|
| 0 | 0 |
| 1 | 8 |
| 3 | 23 |
| 5 | 37 |
| 7 | 50 |
| 9 | 63 |
| 10 | 68 |

a)  Identify the input quantity (include units)._____

   Identify the input variable._____

   Identify the output quantity (include units)._____

   Identify the output variable._____

b)  Write the data as a set of ordered pairs.

c)  Interpret the meaning of the ordered pair (7, 50).

d)  Is the number of hot dogs eaten a function of time? Why or why not?

e)  Is time a function of the number of hot dogs eaten? Why or why not?

**Section 1.2: Multiple Representations of Functions**

5. Determine whether the following sets of ordered pairs represent a functional relationship. Justify your answer.

   a)  $R = \{(2, 4), (3, 8), (-2, 6)\}$

   b)  $T = \{(3, -2), (4, -1), (5, 8), (3, -2)\}$

   c) $L = \{(3, -5), (1, -2), (2, -2), (3, 5)\}$

   d)  $A = \{(5, -5), (6, -5), (7, -5\}$

   e)  $F = \{(2, -3), (6,\quad), (4, 8)\}$

6.  Determine whether the following tables of values represent a functional relationship.  Justify your answer.

a)

| $x$ | $f(x)$ |
|---|---|
| 3 | 0 |
| 1 | 5 |
| 2 | 8 |
| 3 | 12 |
| 4 | 14 |

b)

| $x$ | $g(x)$ |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 2 | -1 |
| 3 | 2 |
| 4 | -2 |

c)

| $x$ | $f(x)$ |
|---|---|
| 0 | -3 |
| 1 | -4 |
| 2 | -5 |
| 3 |  |
| 4 | -6 |

d)

| $r$ | −1 | 1 | 2 | 1 |
|------|----|----|----|----|
| $h(r)$ | 3 | 5 | 3 | 5 |

e)

| $s$ | 0 | 1 | 2 | 3 | 4 |
|------|----|----|----|----|----|
| $l(s)$ | 5 | 10 | 15 | | 25 |

f)

| $t$ | 0 | 1 | 2 |
|------|----|----|----|
| $p(t)$ | 43 | 45 | 43 |

g)

| $s$ | −1 | −1 | −1 | −1 |
|------|----|----|----|----|
| $t(s)$ | 8 | 12 | −4 | −9 |

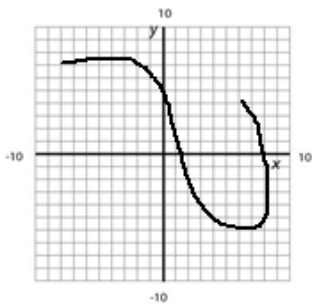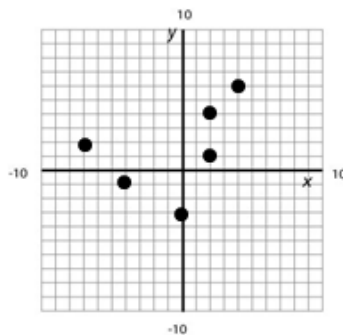7.  Determine whether the following graphs represent a functional relationship.  Justify your answer.
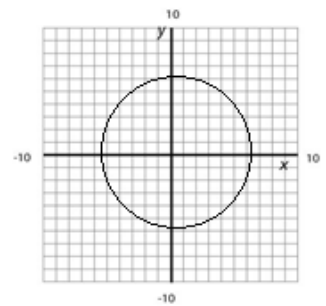
a)
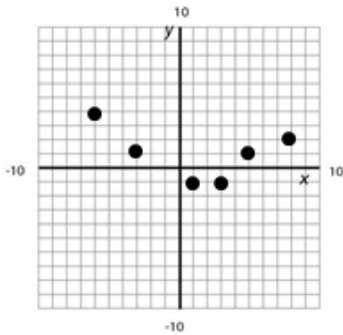


b)
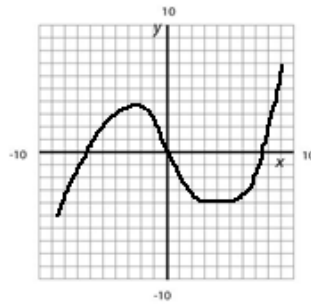


c)
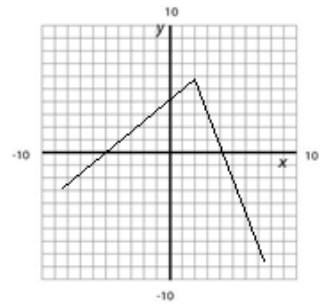


d)



e)



f)

8)  Determine whether the following scenarios represent functions. Explain your choice for each
   of the following. Remember when the word "function" is used, it is in a purely
   MATHEMATICAL sense, not in an everyday sense.

   a)  Is a person's height a function of their age?

   b)  Is a person's age a function of their date of birth?

   c)  Is the growth of a tree a function of the monthly rainfall?

   d)  John says that time he will spend on vacation will be determined by the number of overtime hours he
      works on his job.  Is it true that his vacation time is a function of his overtime hours?

   e)  Sara says that the number of tomatoes she grows will be determined by the weather.  Is it true that the
      size of his tomato crop is a function of the weather?

9.  Determine whether the following functions represented by the graphs below are increasing,
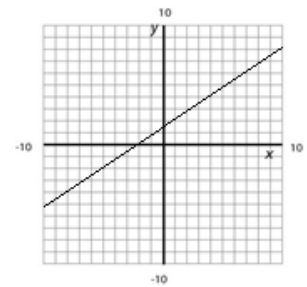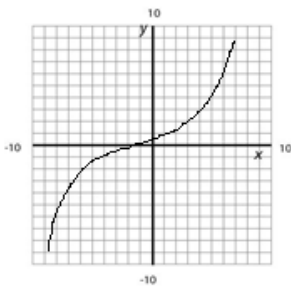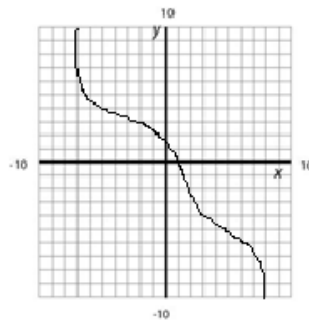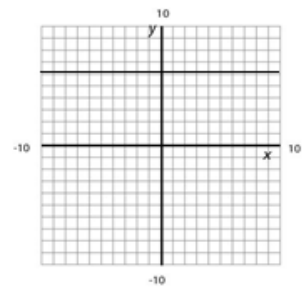   decreasing, or constant.

a.
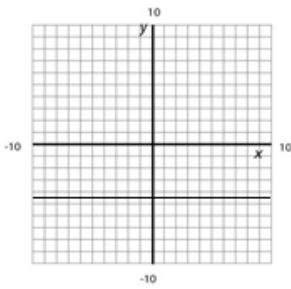
b.
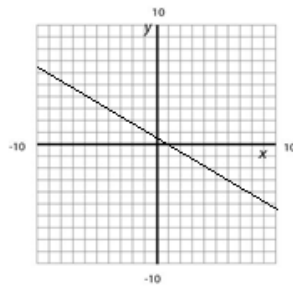
c.

d.

e.

f.

10.  Determine whether the following functions represented by the tables below are increasing, decreasing, or constant.

a)

| x | f(x) |
|----|------|
| -2 | 5 |
| -1 | 8 |
| 0 | 23 |
| 1 | 37 |
| 2 | 49 |

b)

| t | s(t) |
|----|------|
| 4 | 5 |
| 7 | 3 |
| 12 | -8 |
| 13 | -12 |
| 17 | -25 |

c)

| x | g(x) |
|----|------|
| 0 | 5 |
| 1 | 5 |
| 2 | 5 |
| 3 | 5 |
| 4 | 5 |

d)

| x | 0 | 1 | 2 | 3 |
|------|---|---|---|---|
| h(x) | 2 | 2 | 2 | 2 |

e)

| x | -5 | 1 | 8 | 9 |
|------|----|----|----|----|
| h(x) | 27 | 26 | 24 | 23 |

f)

| x | 0 | 1 | 2 | 3 |
|------|-----|-----|-----|-----|
| h(x) | -22 | -20 | -18 | -15 |

## Section 1.3:  Function Evaluation

11. Given the function $f(x) = -x + 6$, evaluate each of the following

a) $f(2) =$

b) $f(-1) =$

c) $f(0) =$

12. Given the function $s(t) = 14 - 2t$, evaluate each of the following:
    a) $s(-3) =$

    b) $s(4) =$

    c) $s(0) =$

13. Given the function $h(c) = 2c^2 - 3c + 4$, evaluate each of the following:
    a) $h(-2) =$

    b) $h(3) =$

    c) $h(0) =$

14. Given the function $g(x) = -x^2 + 3x$, evaluate each of the following:
    a) $g(-3) =$

    b) $g(4) =$

    c) $g(0) =$

15. Given the function $f(x) = -x + 6$, evaluate each of the following
   a) $f(2x) =$



   b) $f\left(\frac{1}{2}x\right) =$



   c) $f(x - 3) =$




16. Given the function $s(t) = 14 - 2t$, evaluate each of the following:
   a) $s(3t) =$



   b) $s\left(\frac{1}{4}t\right) =$



   c) $s(t + 4) =$

17. Given the function $h(c) = 2c^2 - 3c + 4$, evaluate each of the following:

    a) $h(-2c) =$

    b) $h(c - 1) =$

    c) $h(x + 2) =$

18. Given $f(x) = 3x - 6$, determine each of the following. Also determine if you are given an input or output and whether you are finding an input or output and write your result as an ordered pair.

    a) Find $f(2) =$                                        b) Find $x$ if $f(x) = 3$

        Given input or output?_____            Given input or output?_____

        Finding input or output?_____            Finding input or output?_____

        Ordered pair:_____            Ordered pair:_____

    c) Find $f(-4) =$                                        d) Find $x$ if $f(x) = -12$

        Given input or output?_____            Given input or output?_____

        Finding input or output?_____            Finding input or output?_____

        Ordered pair:_____            Ordered pair:_____

19. Given $g(x) = \frac{3}{2}x - \frac{1}{2}$, determine each of the following. Write your final result as a fraction when appropriate.

    a) Find $g(4) =$                         b) Find $x$ if $g(x) = 3$

        Given input or output?_____      Given input or output?_____

        Finding input or output?_____      Finding input or output?_____

        Ordered pair:_____      Ordered pair:_____

    c) Find $g(-8) =$                    d) Find $x$ if $g(x) = -\frac{7}{2}$

        Given input or output?_____      Given input or output?_____

        Finding input or output?_____      Finding input or output?_____

        Ordered pair:_____      Ordered pair:_____

20. Use the table below to find the function values.

| $t$ | $-8$ | $-3$ | 2 | 7 | 12 |
|------|------|------|---|----|-----|
| $k(t)$ | 14 | 7 | 0 | $-7$ | $-14$ |

    a) $k(7) =$

    b) $k(-3) =$

    c) $k(-8) =$

21. Given the table for the function below, determine each of the following. Also determine if you are given an input or output and whether you are finding an input or output and write your result as an ordered pair.

| $x$ | −6 | −4 | −2 | 0 | 2 |
|------|-----|-----|-----|-----|-----|
| $f(x)$ | 9 | 3 | −5 | −12 | −17 |

a) Find $x$ if $f(x) = -12$

b) Find $f(-4) =$

Given input or output?_____

Finding input or output?_____

Ordered pair:_____

Given input or output?_____

Finding input or output?_____

Ordered pair:_____

c) Find $x$ if $f(x) = 3$

d) Find $f(2) =$

Given input or output?_____

Finding input or output?_____

Ordered pair:_____
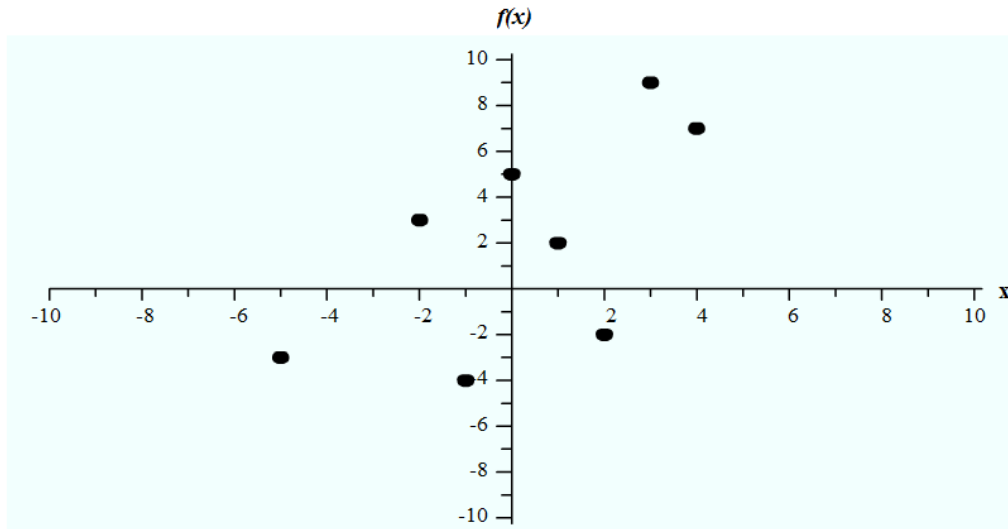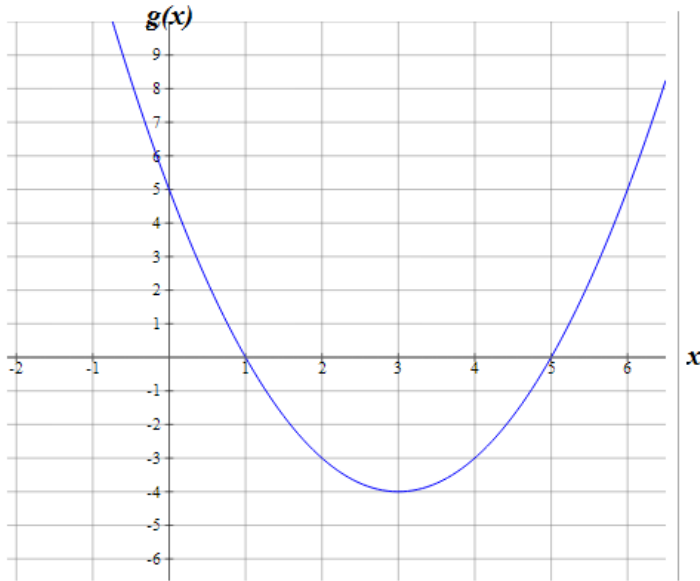
Given input or output?_____

Finding input or output?_____

Ordered pair:_____

22. Given the graph for the function below, determine each of the following. Also determine if you are given an input or output and whether you are finding an input or output and write your result as an ordered pair.



a) Find $x$ if $f(x) = 5$

   Given input or output?_____

   Finding input or output?_____

   Ordered pair:_____

b) Find $f(-2) =$

   Given input or output?_____

   Finding input or output?_____

   Ordered pair:_____

c) Find $x$ if $f(x) = 3$

   Given input or output?_____

   Finding input or output?_____

   Ordered pair:_____

d) Find $f(3) =$

   Given input or output?_____

   Finding input or output?_____

   Ordered pair:_____

23. Given the graph for the function below, determine each of the following. Also determine if you are given an input or output and whether you are finding an input or output and write your result as an ordered pair.



a)  Find any *x-values* where $g(x) = 5$

    Given input or output?_____

    Finding input or output?_____

    Ordered pair:_____

b)  Find $g(2) =$

    Given input or output?_____

    Finding input or output?_____

    Ordered pair:_____

c. Find any *x-values* where $g(x) = 0$

    Given input or output?_____

    Finding input or output?_____

    Ordered pair:_____

d)  Find $g(3) =$

    Given input or output?_____

    Finding input or output?_____

    Ordered pair:_____

24. Consider the function $y = 2x - 3$

a) Use your graphing calculator to complete the table below

| $x$ | $-3$ | $-1$ | $0$ | $1$ | $3$ |
|---|---|---|---|---|---|
| $y$ |  |  |  |  |  |

b) Use your graphing calculator to sketch the graph of $y = 2x - 3$

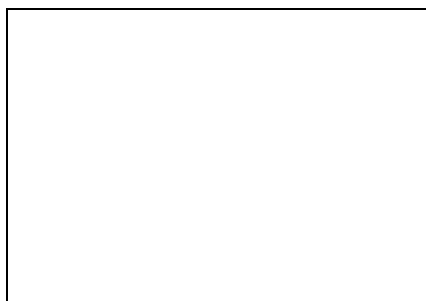Use the standard viewing window (ZOOM➔6)  xmin= -10, xmax=10, ymin=-10, ymax=10 ,

Draw what you see on your calculator screen.
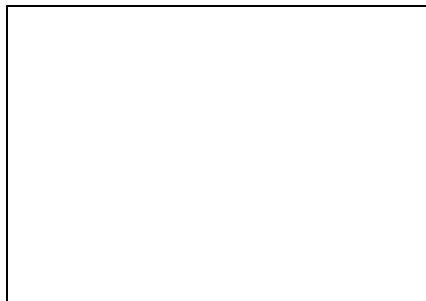
c) Use your graphing calculator to sketch the graph of $y = 2x - 3$.

Use viewing window xmin= 0, xmax= 3, ymin= 0, ymax= 5 ,

Draw what you see on your calculator screen.
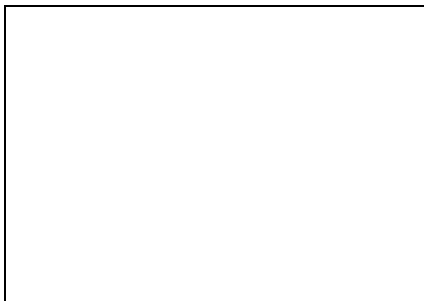
25. Consider the function $f(x) = -3x + 4$

a)  Use your graphing calculator to complete the table below

| $x$ | $-3$ | $-1$ | $0$ | $1$ | $3$ |
|---|---|---|---|---|---|
| $y$ |  |  |  |  |  |

b)   Use your graphing calculator to sketch the graph of $f(x) = -3x + 4$

Use the standard viewing window (ZOOM→6)  xmin= -10, xmax=10, ymin=-10, ymax=10 ,
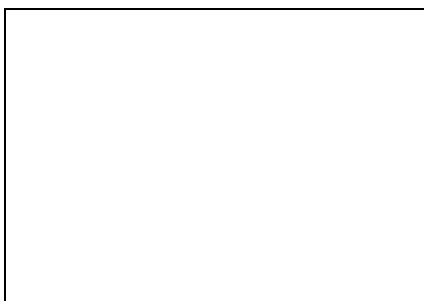
Draw what you see on your calculator screen.

c)   Use your graphing calculator to sketch the graph of $f(x) = -3x + 4$

Use viewing window xmin= 0, xmax= 5, ymin= −15, ymax= 5 ,

Draw what you see on your calculator screen.

**Section 1.4:  Domain and Range**

26.  For each set of ordered pairs, determine the domain and the range.
     a)  $g = \{(3, -2), (5, -1), (7, 8), (9, -2), (11, 4), (13, -2)\}$

     Domain:

     Range:


     b) $f = \{(-2, -5), (-1, -5), (0, -5), (1, -5)\}$

     Domain:

     Range:


     c)  $h = \{(-3, 2), (1, -5), (0, -3), (4, -2)\}$

     Domain:

     Range:


27.  For each table of values, determine the domain and range of the function.

a)
| $x$ | $f(x)$ |
|-----|--------|
| −10 | 3 |
| −5 | 8 |
| 0 | 12 |
| 5 | 15 |
| 10 | 18 |

Domain:

Range:


b)
| $x$ | $g(x)$ |
|-----|--------|
| −20 | −4 |
| −10 | 14 |
| 0 | 32 |
| 10 | 50 |
| 20 | 68 |
| 30 | 86 |

Domain:

Range:

c)

| H | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 |
|------|----|----|----|----|----|----|----|----|----|
| T(h) | 54 | 62 | 66 | 69 | 72 | 73 | 74 | 73 | 72 |

Domain:

Range:

28. For each graph, determine the domain and range of the function.  Use inequality and interval notation when appropriate.
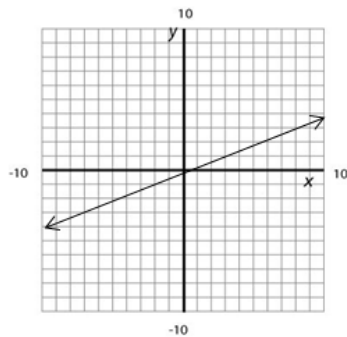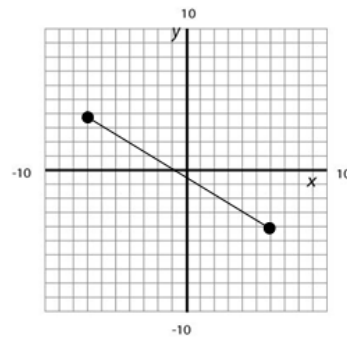
a)



b)



**Domain:**

Inequality notation:_____

Interval notation:_____

**Range:**

Inequality notation:_____
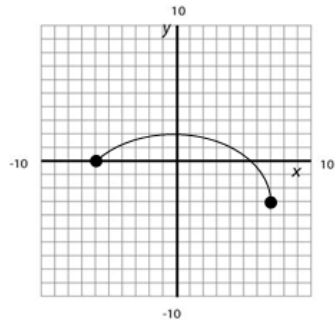
Interval notation:_____

**Domain:**

Inequality notation:_____

Interval notation:_____

**Range:**

Inequality notation:_____

Interval notation:_____

c)



d)



**Domain:**

Inequality notation:_____

Interval notation:_____

**Domain:**

Inequality notation:_____
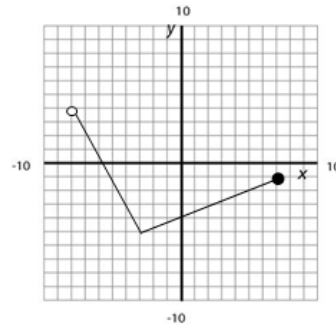
Interval notation:_____

**Range:**

Inequality notation:_____

Interval notation:_____

**Range:**

Inequality notation:_____

Interval notation:_____

**Section 1.5:  Applications of Functions**

29.  A local window washing company charges $0.50 per window plus a base fee of $20.00 per appointment. They can wash a maximum of 200 windows per appointment.

   a) Let $C$ represent the total cost of an appointment and $w$ represent the number of windows washed. Using correct and formal function notation, write a function that represents total cost as a function of windows washed.

   b) Identify the practical domain of this function by filling in the blanks below.

   Minimum windows washed $\leq w \leq$ Maximum windows washed

   Practical Domain: _____ $\leq w \leq$ _____

   c) Identify the practical range of this function by filling in the blanks below.

   Minimum Cost $\leq C(w) \leq$ Maximum Cost

   Practical Range: _____ $\leq C(w) \leq$ _____

   d) Enter the equation for $C$ into the Y= part of your calculator. Then use the TABLE feature to complete the table below:

| $w$ | 0 | 50 | 150 | 200 |
|---|---|---|---|---|
| $C(w)$ | | | | |

   e) Use the TABLE to determine the value of $C(50)$. Circle the appropriate column in the table. Write a sentence explaining the meaning of your answer.

   f) Use the TABLE to determine $w$ when $C(w) = 45$. Circle the appropriate column.   Write a sentence explaining the meaning of your answer.

   g) Use your FUNCTION from part a) to determine the value of $w$ when $C(w) = 45$. Set up the equation, $C(w) = 45$ then solve for the value of w.

30. Suppose the number of pizzas you can make in an 8 hour day is determined by the function $P(t) = 12t$ where $P$ is the output (Pizzas made) and $t$ is the input (Time in hours).

    a) Graph this function using your calculator. [Go to Y= and type 12x into the Y1 slot. Then, press WINDOW and enter xmin = 0, xmax =8, ymin = 0, and ymax=96 then press GRAPH]. Show a good graph in the space below.
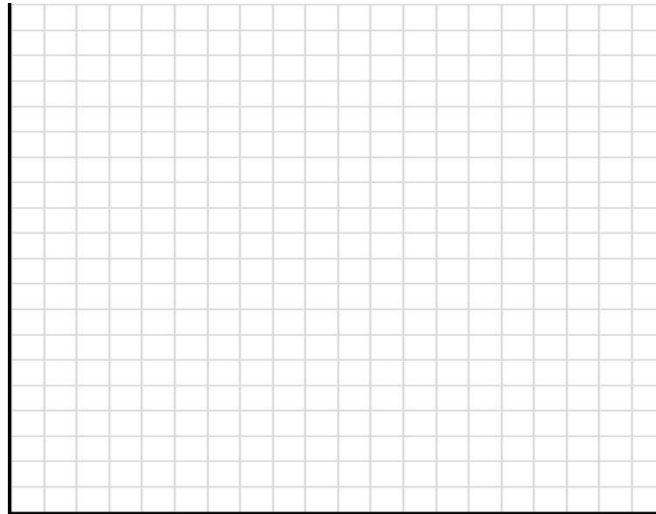
    b) Use the Table feature of your graph and identify the first and last ordered pairs that are on the graph (based on the information above). [2$^{nd}$>Graph will take you to the table]. Include both ordered pairs and function notation.

    c) What is the INPUT quantity (including units) for this function? Name the smallest and largest possible input quantity then use this information to identify the PRACTICAL DOMAIN.

       Input quantity (including units):_____

       Practical domain:
                                   Inequality notation:_____

                                   Interval notation:_____

d) What is the OUTPUT quantity (including units) for this function? Name the smallest and largest possible output quantity then use this information to identify the PRACTICAL RANGE.

Output quantity (including units):_____

Practical range:

          Inequality notation:_____

          Interval notation:_____

e) Find $P(3)$ and interpret its meaning in the context of the problem.

f) Find $t$ so that $P(t) = 70$ and interpret its meaning in the context of the problem.

31. The life expectancy for males in the United States from the year 1900 until 2020 can be modeled by the function $L(x) = 0.27x + 48.3$, where $L$ is the life expectancy and $x$ is the number of years since 1900.

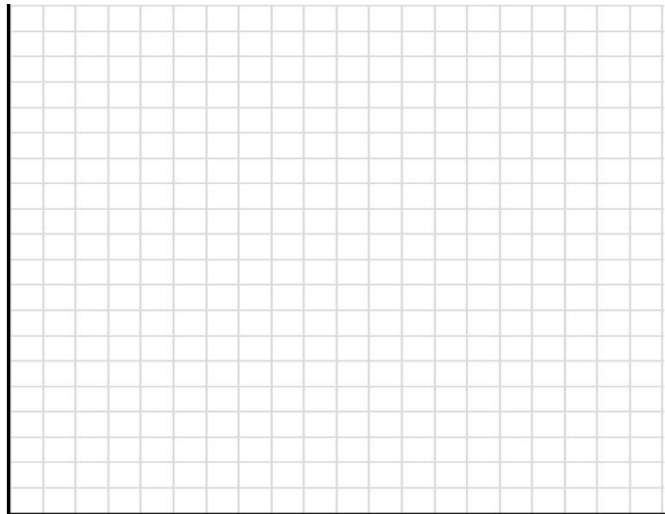    a) Which letter, $L$ or $x$ is used for input?

    b) What does the INPUT represent? Include units.

    c) Which letter, $L$ or $x$, is used for output?

    d) What does the OUTPUT represent? Include units.

    e)  Draw a neat, labeled and accurate sketch of this graph in the space below.

| $x$ | $L(x)$ |
|-----|--------|
| 0   |        |
| 20  |        |
| 40  |        |
| 60  |        |
| 80  |        |
| 100 |        |
| 120 |        |

    f)  What is the practical domain of $L(x)$?   Use proper inequality notation.

g) What is the practical range of $L(x)$?  Use proper inequality notation.

h) What is the life expectancy of a man born in Iowa in 1950?

i) If a man is expected to live to the age of 60, approximate the year he was born. (Round to one decimal place)?