ACMAT117 Fall 2024
Professor Manguba-Glover
Section 1.3 Classwork (CW 2) Name: ________________________________

Complete as many of the following problems as you can with your group. You do not have to go in order. Each group will be given a specific problem that they must complete and present to either Professor MG or to Stefanie before they leave.

If **your entire table** finishes early, and you have presented your given problem, you may leave early.

(1) Write each verbal function representation in its symbolic representation. Then simplify the expression. Let x represent the number:

(a) y is six more than the product of negative four and a number

(b) Divide a number by 6 then add 5 to produce y

(c) y is equal to 3 less than a number multiplied by itself

Solution

(a) The word "more" indicates addition, the word "product" indicates multiplication, and the words "a number" indicate a variable (most often, we use x). Putting this together, we get

$$\boxed{y = -4x + 6}$$

(b) The word "divide" indicates division, the words "a number" indicate a variable (most often, we use x), the word "add" indicates addition, and the word "produce" indicates an equal sign. Putting this together, we get

$$\boxed{y = \frac{x}{6} + 5}$$

(c) The words "is equal" indicates an equal sign, the word "less" indicates subtraction, the words "a number" indicates a variable (most often, we use x), and the words "multiplied by itself" indicate squaring (i.e. ^{2}). Putting this together we get

$$\boxed{y = x^2 - 3}$$

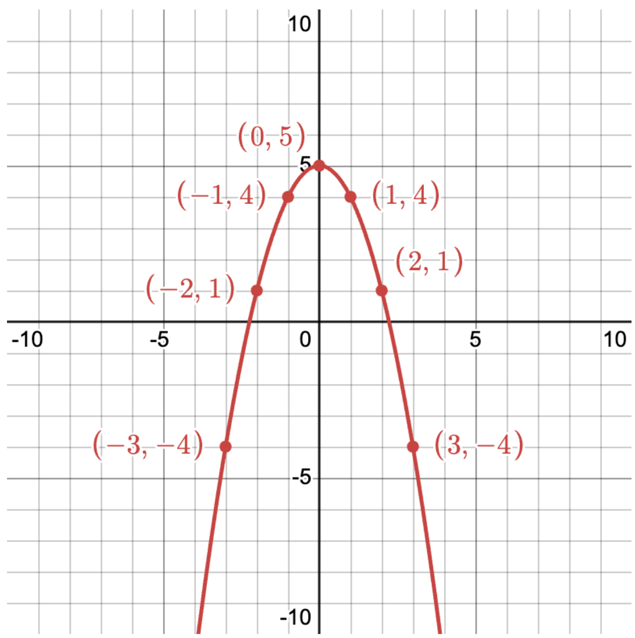
□

(2) Sketch the graph of $y = 5 - x^2$ by making a table of values that include $x = -3, -2, -1, 0, 1, 2, 3$

Solution

x	y calculation	y
-3	$5 - (-3)^2 = 5 - 9$	-4
-2	$5 - (-2)^2 = 5 - 4$	1
-1	$5 - (-1)^2 = 5 - 1$	4
0	$5 - (0)^2 = 5 - 0$	5
1	$5 - 1^2 = 5 - 1$	4
2	$5 - 2^2 = 5 - 4$	1
3	$5 - 3^2 = 5 - 9$	-4

Plotting these points and connecting the, our graph looks like



□

(3) Determine if each set of ordered pairs represents a function:

(a) $A = \{(-2,3),(-1,2),(-0,-3),(-2,4)\}$
(b) $B = \{(1,4),(2,5),(-3,-4),(-1,7),(0,4)\}$

Solution All we have to do is determine if there are two points with the same x-coordinate, but different y-coordinates.

(a) There are two points with the x-coordinate of $x = -2$, but they have two different y-values, so this is $\boxed{\text{not a function}}$
(b) All of the x-values are unique, so this is $\boxed{\text{a function}}$

□

(4) Let $f(x) = \frac{x}{x-1}$

(a) If possible, evaluate $f(2)$, $f(1)$, and $f(x+1)$
(b) Find the domain of f in set notation and in interval notation.

Solution

(a)

$$\begin{aligned} f(2) &= \frac{2}{2-1} \\ &= \frac{2}{1} \\ &= \boxed{1} \end{aligned}$$

$$\begin{aligned} f(1) &= \frac{1}{1-1} \\ &= \frac{1}{0} \\ &= \boxed{\text{undefined}} \end{aligned}$$

$$\begin{aligned} f(x+1) &= \frac{x+1}{(x+1)-1} \\ &= \boxed{\frac{x+1}{x}} \end{aligned}$$

(b) We cannot divide by zero, so

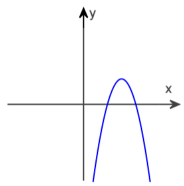
$$x - 1 \neq 0 \Leftrightarrow x \neq 1$$

Writing this in set notation, we have $\boxed{\{x | x \neq 1\}}$. In interval notation, this would be $\boxed{(-\infty, 1) \cup (1, \infty)}$

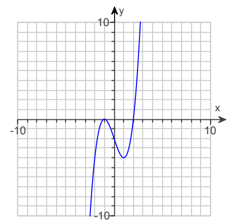
□

(5) Use the vertical line test to determine if y is a function of x in the graph.

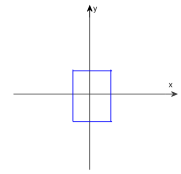
(a)



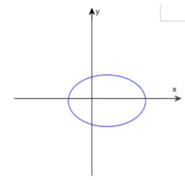
(b)



(c)



(d)



Solution

(a) This does pass the vertical line test, so it is $\boxed{\text{a function}}$

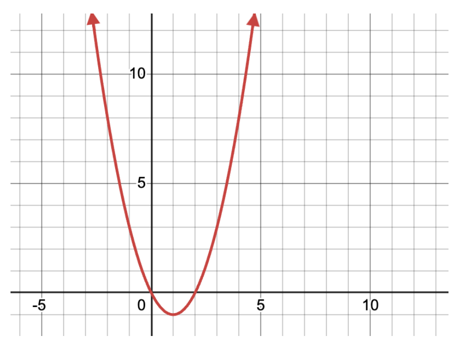
(b) This does pass the vertical line test, so it is $\boxed{\text{a function}}$

(c) This does not pass the vertical line test, so it is $\boxed{\text{not a function}}$

(d) This does not pass the vertical line test, so it is $\boxed{\text{not a function}}$

□

(6) Let $g(x) = x^2 - 2x$, whose graph is given below



(a) Find the domain and range of g using interval notation.

(b) Evaluate $g(-1)$ using the formula for $g(x)$. Check your answer using the graph.

Solution

(a) The domain is all of the x-values, so we want to find the smallest x-value and the largest x-value. Because there are arrows at the end of the graph, the smallest x-value is $-\infty$ and the largest x-value is ∞. In interval notation, this is $\boxed{(-\infty, \infty)}$

(b) The range is all of the y-values, so we want to find the lowest y-value and the highest y-value. The lowest the graph goes is $y = -1$ and the highest the graph goes is ∞. In interval notation, this is $\boxed{[-1, \infty)}$

□

(7) If $f(x) = -4x^2 + 3x - 2$, find the following

(a) $f(2)$

(b) $f(-1)$

(c) $f(x-2)$

Solution

(a)

$$\begin{aligned} f(2) &= -4(2)^2 + 3(2) - 2 \\ &= -4(4) + 6 - 2 \\ &= -16 + 6 - 2 \\ &= \boxed{-12} \end{aligned}$$

(b)

$$\begin{aligned} f(-1) &= -4(-1)^2 + 3(-1) - 2 \\ &= -4(1) - 3 - 2 \\ &= -4 - 3 - 2 \\ &= \boxed{-9} \end{aligned}$$

(c)

$$\begin{aligned} f(x-2) &= -4(x-2)^2 + 3(x-2) - 2 \\ &= -4(x-2)(x-2) + 3x - 6 - 2 \\ &= -4(x^2 - 4x + 4) + 3x - 8 \\ &= -4x^2 + 16x - 16 + 3x - 8 \\ &= \boxed{-4x^2 + 19x - 24} \end{aligned}$$

□

Key:

(1) (a) $y = -4x + 6$
 (b) $y = \frac{x}{6} + 5$
 (c) $y = x^2 - 3$

(2) Use a graphing utility to check

(3) A is not a function, B is a function

(4) (a) $f(2) = 2$, $f(1)$ is undefined, $f(x+1) = \frac{x+1}{x}$
 (b) $\{x|x \neq 1\}$, $(-\infty, 1) \cup (1, \infty)$

(5) a and b are functions, c and d are not

(6) (a) D: $(-\infty, \infty)$, R: $[-1.\infty)$
 (b) $g(-1) = 3$

(7) (a) -12
 (b) -9
 (c) $-4x^2 + 19x - 24$