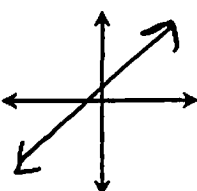
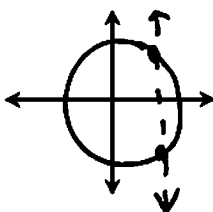
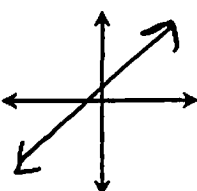
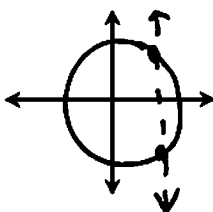
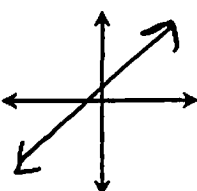
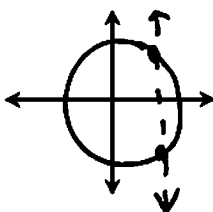
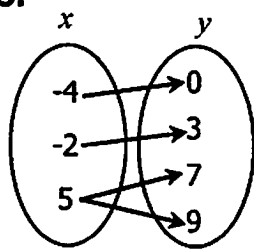


Name: <u>Kty</u>	Date: _____
Topic: <u>Relations & Functions</u>	Class: _____

Main Ideas/Questions	Notes/Examples																				
RELATIONS	- A set of ordered pairs. Can be shown in a <u>table</u>, <u>mapping</u>, <u>graph</u>, or expressed as an <u>equation</u>. - The set of x-values is called the <u>domain</u> and the set of y-values is called the <u>range</u>. - A relation with distinct points is called <u>discrete</u>. A relation with connected lines or curves is called <u>continuous</u>.																				
FUNCTION	A relation in which each element of the domain is paired with exactly one element of the range. <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px; text-align: center;">FUNCTION:</td><td style="width: 50%; padding: 5px; text-align: center;">NOT A FUNCTION:</td></tr> <tr> <td style="padding: 10px; text-align: center;">$\{(0, 1), (-5, 2), (6, -2), (5, 7)\}$</td><td style="padding: 10px; text-align: center;">$\{(-7, 2), (6, -1), (6, 2), (-3, 9)\}$</td></tr> <tr> <td colspan="2" style="padding: 5px; text-align: center;">This means x-values do not repeat!</td></tr> </table>	FUNCTION:	NOT A FUNCTION:	$\{(0, 1), (-5, 2), (6, -2), (5, 7)\}$	$\{(-7, 2), (6, -1), (6, 2), (-3, 9)\}$	This means x-values do not repeat!															
FUNCTION:	NOT A FUNCTION:																				
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This means x-values do not repeat!																					
Vertical Line Test In order to be a function, a vertical line can not pass through more than one point in the relation.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px; text-align: center;">FUNCTION:</td><td style="width: 50%; padding: 5px; text-align: center;">NOT A FUNCTION:</td></tr> <tr> <td style="padding: 10px; text-align: center;">  </td><td style="padding: 10px; text-align: center;">  </td></tr> </table>	FUNCTION:	NOT A FUNCTION:																		
FUNCTION:	NOT A FUNCTION:																				
																					
Directions: Find the domain and range of each relation. Then determine if the relation is a function. If it is a function, state whether it is one-to-one.																					
1. $\{(-1, -9), (0, -5), (4, 3), (6, -2)\}$ $D = \underline{\{-1, 0, 4, 6\}}$ $R = \underline{\{-9, -5, -2, 3\}}$ Function? <u>Yes</u>	2. $\{(5, 2), (-3, 4), (5, -6), (8, 0)\}$ $D = \underline{\{-3, 5, 8\}}$ $R = \underline{\{-6, 0, 2, 4\}}$ Function? <u>No</u>																				
3. <table border="1" style="display: inline-table; margin-right: 20px;"> <tr><td>x</td><td>y</td></tr> <tr><td>7</td><td>-8</td></tr> <tr><td>2</td><td>3</td></tr> <tr><td>0</td><td>-1</td></tr> <tr><td>-4</td><td>3</td></tr> </table> $D = \underline{\{-4, 0, 2, 7\}}$ $R = \underline{\{-8, -1, 3\}}$ Function? <u>Yes</u>	x	y	7	-8	2	3	0	-1	-4	3	4. <table border="1" style="display: inline-table; margin-right: 20px;"> <tr><td>x</td><td>y</td></tr> <tr><td>10</td><td>0</td></tr> <tr><td>15</td><td>3</td></tr> <tr><td>18</td><td>7</td></tr> <tr><td>24</td><td>11</td></tr> </table> $D = \underline{\{10, 15, 18, 24\}}$ $R = \underline{\{0, 3, 7, 11\}}$ Function? <u>Yes</u>	x	y	10	0	15	3	18	7	24	11
x	y																				
7	-8																				
2	3																				
0	-1																				
-4	3																				
x	y																				
10	0																				
15	3																				
18	7																				
24	11																				

5.

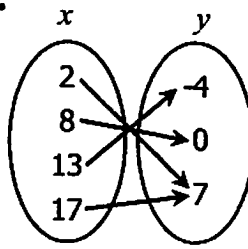


$$D = \{-4, -2, 5\}$$

$$R = \{0, 3, 7, 9\}$$

Function? NO

6.

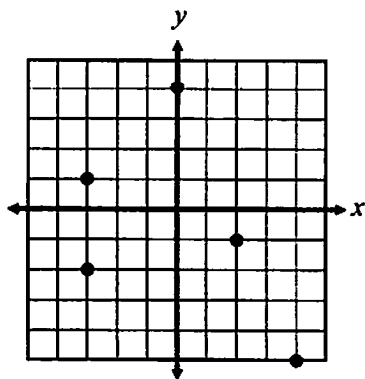


$$D = \{2, 8, 13, 17\}$$

$$R = \{-4, 0, 7\}$$

Function? Yes

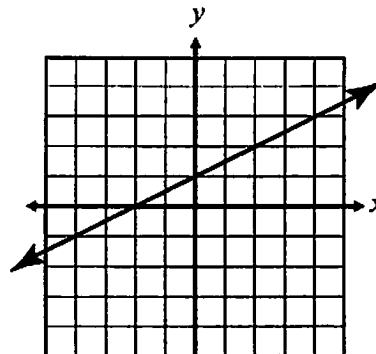
7.



$$D = \{-3, 0, 2, 4\} \quad R = \{-5, -2, -1, 1, 4\}$$

Function? NO

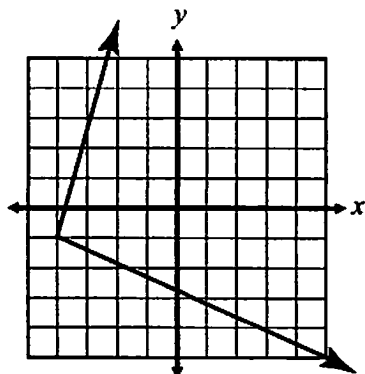
8.



$$D = \text{All real \#}'s \quad R = \mathbb{R}$$

Function? Yes

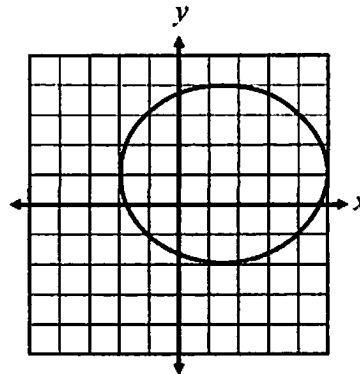
9.



$$D = x \geq -4 \quad R = \mathbb{R}$$

Function? NO

10.



$$D = -2 \leq x \leq 2 \quad R = -2 \leq y \leq 2$$

Function? NO

11. $y = -x^2 + 3$

(graph in calc for 11-14)

$$D = \mathbb{R}$$

$$R = y \leq 3$$

Function? Yes

12. $y = -5x - 1$

$$D = \mathbb{R}$$

$$R = \mathbb{R}$$

Function? Yes

13. $y = -7$

$$D = \mathbb{R}$$

$$R = y = -7$$

Function? Yes

14. $x = -1$

$$D = x = -1$$

$$R = \mathbb{R}$$

Function? NO

Name: <u>Key</u>	Date: _____
Topic: _____	Class: _____

Main Ideas/Questions	Notes/Examples
FUNCTION NOTATION	Equations that represent functions are often written in function notation .
	Example: $y = 2x + 7 \rightarrow f(x) = 2x + 7$ <u> x </u> is the input and <u> f(x) </u> is the output!
Evaluating FUNCTIONS	Function notation is specifically useful for finding a value in the range that corresponds to a certain domain value. Example: If $f(x) = 2x + 7$, find $f(-3)$ $f(-3) = 2(-3) + 7$ $f(-3) = -6 + 7$ $f(-3) = 1$
Use $f(x) = -5x - 14$ and $g(x) = -x^2 + 9x - 1$ for questions 1-6.	
1. $f(-9)$ $f(-9) = -5(-9) - 14$ $f(-9) = 45 - 14$ $f(-9) = 31$	2. $f\left(\frac{3}{10}\right)$ $f\left(\frac{3}{10}\right) = -5\left(\frac{3}{10}\right) - 14$ $f\left(\frac{3}{10}\right) = -\frac{3}{2} - 14$ $f\left(\frac{3}{10}\right) = -\frac{31}{2}$
3. $g(0.4)$ $g(0.4) = -(0.4)^2 + 9(0.4) - 1$ $g(0.4) = -0.16 + 3.6 - 1$ $g(0.4) = 3.44 - 1$ $g(0.4) = 2.44$	4. $g(-7)$ $g(-7) = -(-7)^2 + 9(-7) - 1$ $g(-7) = -49 - 63 - 1$ $g(-7) = -112 - 1$ $g(-7) = -113$
5. $f(1) - f(-4)$ $f(1) = -5(1) - 14$ $= -5 - 14$ $= -19$ $f(-4) = -5(-4) - 14$ $= 20 - 14$ $= 6$ $(-19) - (6) = -25$	6. $2[g(12)]$ $g(12) = -(12)^2 + 9(12) - 1$ $= -144 + 108 - 1$ $= -36 - 1$ $= -37$ $2(-37) = -74$
Use $p(x) = \frac{1}{2} - \frac{4}{3}x$ and $q(x) = 3x - x^3$ for questions 7-12.	
7. $p\left(-\frac{9}{16}\right)$ $p\left(-\frac{9}{16}\right) = \frac{1}{2} - \frac{4}{3}\left(-\frac{9}{16}\right)$ $= \frac{1}{2} + \frac{3}{4}$ $= \frac{5}{4}$	8. $q(5)$ $q(5) = 3(5) - (5)^3 $ $= 15 - 125 $ $= -110 $ $= 110$
9. $q(-2)$ $q(-2) = 3(-2) - (-2)^3 $ $= -6 - (-8) $ $= -2 $ $= 2$	10. $p(18)$ $p(18) = \frac{1}{2} - \frac{4}{3}(18)$ $= \frac{1}{2} - 24$ $= -\frac{47}{2}$

11. $7 - q(4.5)$

$$\begin{aligned} q(4.5) &= |3(4.5) - (4.5)^3| \\ &= |13.5 - 91.125| \\ &= 77.625 \end{aligned}$$

$$7 - (77.625) = \boxed{-70.625}$$

12. $3[p(-1)] + 5$

$$\begin{aligned} p(-1) &= \frac{1}{2} - \frac{4}{3}(-1) \\ &= \frac{1}{2} + \frac{4}{3} \\ &= \frac{11}{6} \end{aligned}$$

$$3\left[\frac{11}{6}\right] + 5 = \frac{11}{2} + 5 = \boxed{\frac{21}{2}}$$

Use $f(x) = 3x + 19$ for questions 13-14.

13. If $f(x) = 34$, find x .

$$3x + 19 = 34$$

$$3x = 15$$

$$\boxed{x = 5}$$

14. If $f(x) = -62$, find x .

$$3x + 19 = -62$$

$$3x = -81$$

$$\boxed{x = -27}$$

15. Owen paid a landscaping company \$108 for an initial lawn treatment, then \$74 per month thereafter. The function $p(t) = 108 + 74t$ represents the total amount of money he will have paid after t months.

a) Find $p(24)$. What does this represent?

$$\begin{aligned} p(24) &= 108 + 74(24) \\ &= 108 + 1776 \\ &= 1884 \end{aligned}$$

\$1884 is the total paid for an initial lawn treatment plus 24 mo. of service.

b) How long as Owen been receiving lawn service if he has paid a total of \$2,994 to date?

$$\begin{aligned} 2994 &= 108 + 74t \\ 2886 &= 74t \\ 39 &= t \end{aligned}$$

$$\boxed{39 \text{ months}}$$

Use $f(x) = -4x + 9$ and $g(x) = x^2 - 5$ for questions 16-20.

16. $f(c+2)$

$$\begin{aligned} f(c+2) &= -4(c+2) + 9 \\ &= -4c - 8 + 9 \\ &= \boxed{-4c + 1} \end{aligned}$$

17. $f(7w-5)$

$$\begin{aligned} f(7w-5) &= -4(7w-5) + 9 \\ &= -28w + 20 + 9 \\ &= \boxed{-28w + 29} \end{aligned}$$

18. $g(-4y^3)$

$$\begin{aligned} g(-4y^3) &= (-4y^3)^2 - 5 \\ &= \boxed{16y^6 - 5} \end{aligned}$$

19. $g(a-3)$

$$\begin{aligned} g(a-3) &= (a-3)^2 - 5 \\ &= (a-3)(a-3) - 5 \\ &= a^2 - 3a - 3a + 9 - 5 \\ &= \boxed{a^2 - 6a + 4} \end{aligned}$$

20. $g(2m+1) - f(3m-7)$

$$\begin{aligned} g(2m+1) &= (2m+1)^2 - 5 \\ &= (2m+1)(2m+1) - 5 \\ &= 4m^2 + 2m + 2m + 1 - 5 \\ &= 4m^2 + 4m - 4 \end{aligned}$$

$$\begin{aligned} f(3m-7) &= -4(3m-7) + 9 \\ &= -12m + 28 + 9 \\ &= -12m + 37 \end{aligned}$$

$$(4m^2 + 4m - 4) - (-12m + 37) = \boxed{4m^2 + 16m - 41}$$