Math 3 Honors **Unit 4 Day 1 NOTES** Interval Notation

Interval notation uses (and [to indicate a portion of the x-axis or y-axis which is included in the range, the domain or a solution. An inequality such as $-2 < x \leq 3$ would be written (-2, 3].

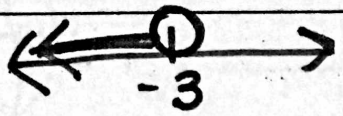
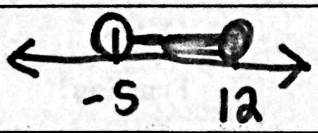
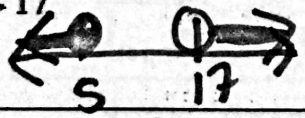
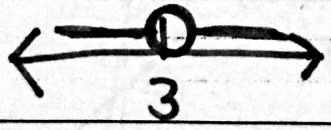
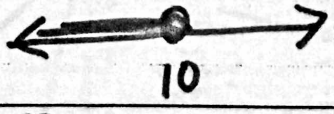
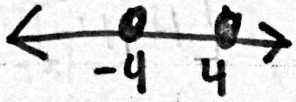
(,) : parentheses indicate the end point number is not part of the solution

[,] : brackets indicate the end point number is part of the solution

U : union; indicates 'or'

∞ : indicates infinitely large positive solution
- ∞ : indicates infinitely large negative solution

Write the following in interval notation:

Expression	Interval Notation
1. $x<-3$ 	$(-\infty,-3)$
2. $x>0$ 	$(0,\infty)$
3. $-5<x\leq 12$ 	$(-5,12]$
4. $x\leq 5$ or $x>17$ 	$(-\infty,5]\cup(17,\infty)$
5. $x\neq 3$ 	$(-\infty,3)\cup(3,\infty)$
6. $x\leq 10$ 	$(-\infty, 10]$
7. $x\leq 5$ and $x\geq -12$	$[-12,5]$
8. $\lvert x\rvert = 4$ 	$[-4]\cup[4]$
9. $\lvert x\rvert \leq -5$	impossible
10. $\lvert x\rvert > -5$	$(-\infty,\infty)$

RELATIONS AND FUNCTIONS

Domain: x-values left to right

Range: y-values bottom to top

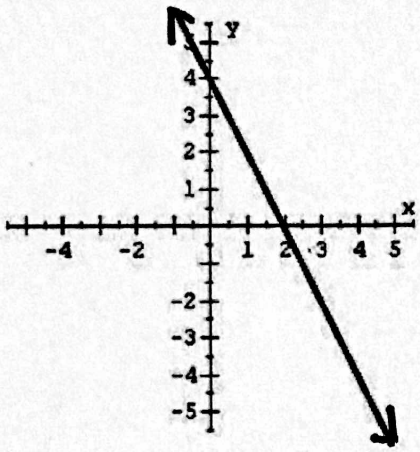
A RELATION - is a correspondence between two variables.
- is a set of points.

A FUNCTION - is a relation such that for each **x-value** in the **Domain**, there is exactly 1 corresponding **y-value** in the **Range**.

Vertical Line Test for a Function

A vertical line can intersect the graph of a function in at most one point, or using an alternate form.

If any vertical line intersects the graph at more than one point, then the graph is NOT the graph of a function.

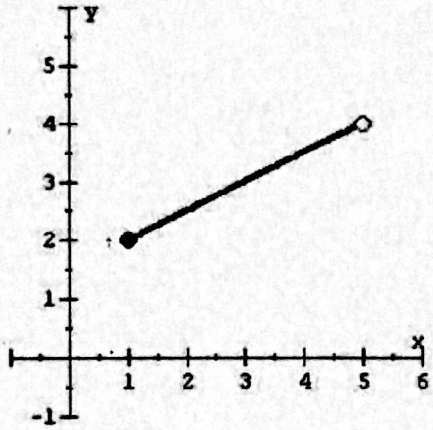


$y = -2x + 4$

Function? Yes

Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

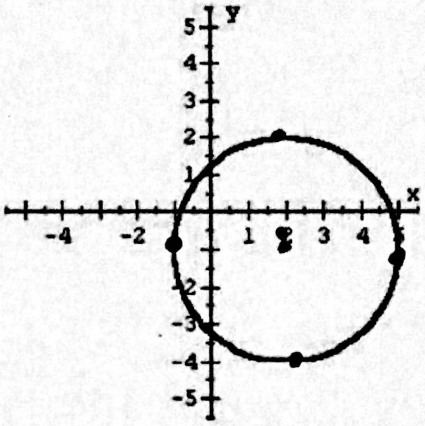


Segment

Function? Yes

Domain: $[1, 5)$

Range: $[2, 4)$

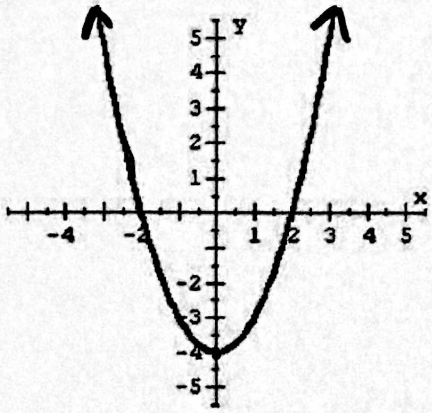


$(x - 2)^2 + (y + 1)^2 = 9$

Function? NO

Domain: $[-1, 5]$

Range: $[-4, 2]$



$y = x^2 - 4$

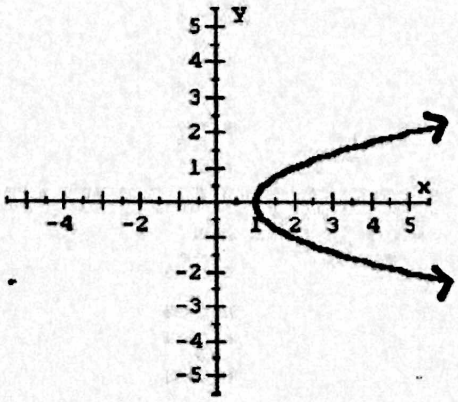
Function? Yes

Domain: $(-\infty, \infty)$

Range: $[-4, \infty)$

Increasing? Decreasing?

$[0, \infty)$ $(-\infty, 0]$

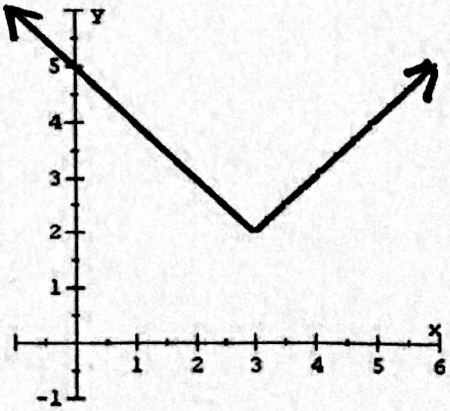


$x = y^2 + 1$

Function? NO

Domain: $[1, \infty)$

Range: $(-\infty, \infty)$



$y = |x - 3| + 2$

Function? Yes

Domain: $(-\infty, \infty)$

Range: $[2, \infty)$

Increasing? Decreasing?

$[3, \infty)$ $(-\infty, 3]$

RELATIONS AND FUNCTIONS 2

A RELATION - is a correspondence between two variables.
- is a set of points.

A FUNCTION - is a relation such that for each x-value in the Domain, there is exactly 1 corresponding y-value in the Range.

Vertical Line Test for a Function

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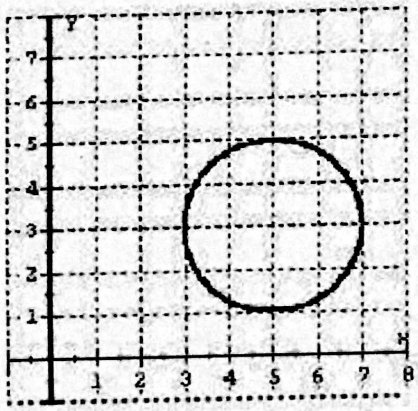
If any vertical line intersects the graph at more than one point, then the graph is NOT the graph of a function.

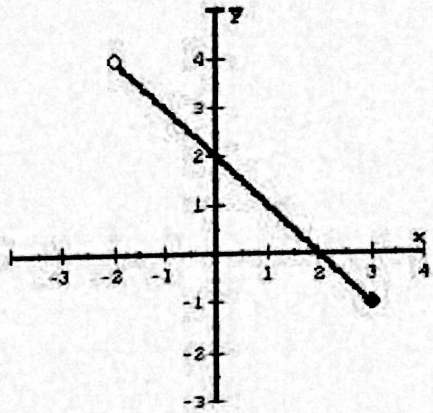


$(x-5)^2 + (y-3)^2 = 4$

Function? NO

Domain: [3,7]

Range: [1,5]

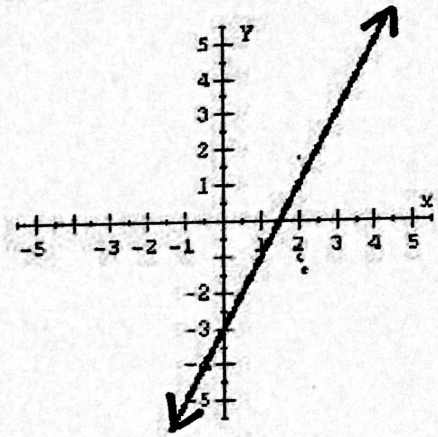


Line Segment

Function? Yes

Domain: (-2, 3]

Range: [-1, 4)

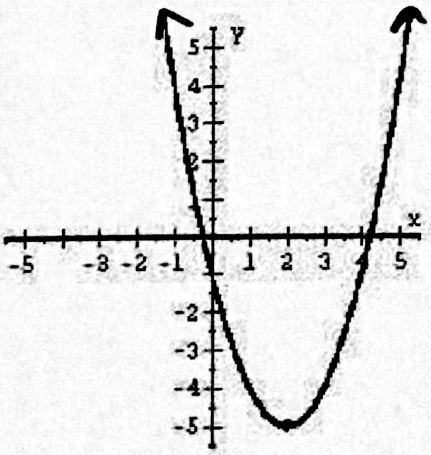


$y = 2x - 3$

Function? Yes

Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$



$y = (x-2)^2 - 5$

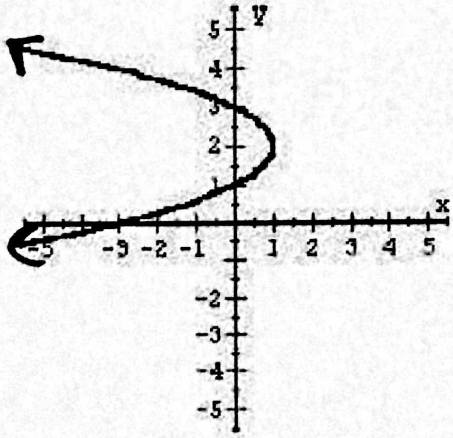
Function? Yes

Domain: $(-\infty, \infty)$

Range: $[-5, \infty)$

Increasing? Decreasing?

$(2, \infty)$ $(-\infty, 2)$

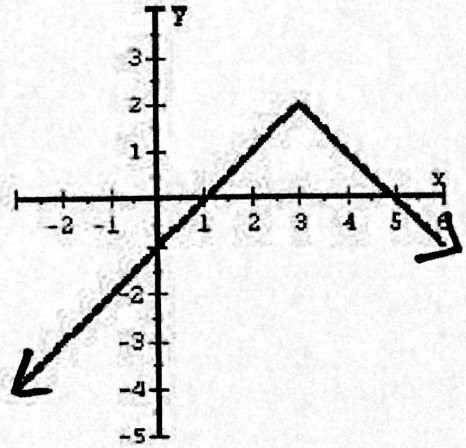


$x = -(y-2)^2 + 1$

Function? NO

Domain: $(-\infty, 1]$

Range: $(-\infty, \infty)$



$y = -|x-3| + 2$

Function? Yes

Domain: $(-\infty, \infty)$

Range: $(-\infty, 2]$

Increasing? Decreasing?

$(-\infty, 3]$ $[3, \infty)$

Name:_____

Date:_____

Factoring Worksheet

Factor Completely:

1. $8y^3 + 4y$

$\boxed{4y(2y^2+1)}$

2. $3ab - 9ac + 15ad$

$\boxed{3a(b-3c+5d)}$

3. $4x^2 + 4x + 1$

$(a)(c)$

$(4)(1) = 4$

$2x \quad 2x$

$\underbrace{4x^2+2x}+\underbrace{2x+1}$

$2x(2x+1)+1(2x+1)$

$\boxed{(2x+1)(2x+1)} \rightarrow \boxed{(2x+1)^2}$

4. $6x^2 - 20x - 16$

$2(3x^2-10x-8) \rightarrow 3x^2-10x-8$

$(3)(-8)$

-24

$-12x \quad 2x$

$\underbrace{3x^2-12x}+\underbrace{2x-8}$

$3x(x-4)+2(x-4)$

$(3x+2)(x-4)$

$\boxed{2(3x+2)(x-4)}$

5. $144xy + 48x^2 + 108y^2$

$\boxed{12(12xy+4x^2+9y^2)}$

6. $4a^2 - 64b^2$

$4(a^2-16b^2)$

$\boxed{4(a-4b)(a+4b)}$

Note: x^2-16

$(x+4)(x-4)$

7. $4x^2 - 9y^2$

$\boxed{(2x+3y)(2x-3y)}$

Name:_____

Date:_____

8. $y^2 + 12y + 36 - 9a^2$

$y(y+12) + 9(4 - a^2)$

$\boxed{y(y+12) + 9(2+a)(2-a)}$

9. $64a^3 + b^3$

$(4a)^3 + (b)^3$

A B

$A^3 + B^3 = (A+B)(A^2 - AB + B^2)$

$= \boxed{(4a+b)(16a^2 - 4ab + b^2)}$

10. $8x^3 - 216y^3$

$\cancel{(2x)^3 - (6y)^3}$

gcf! $8(x^3 - 27y^3)$

$x^3 - 27y^3$

$(x)^3 - (3y)^3$

A B

$= (A-B)(A^2 + AB + B^2)$

$= (x-3y)(x^2 + 3xy + 9y^2)$

$= \boxed{8(x-3y)(x^2+3xy+9y^2)}$

11. $x^2 + 7x + 12$

$\boxed{(x+4)(x+3)}$

12. $x^2 - 12x + 20$

$\boxed{(x-10)(x-2)}$

13. $2a^2 - 18a + 36$

$2(a^2 - 9a + 18)$

$\boxed{2(a-3)(a-6)}$

14. $16x^2 + 32x - 128$

$16(x^2 + 2x - 8)$

$\boxed{16(x+4)(x-2)}$

15. $ax^3 - ay^3 - bx^3 + by^3$

$a(x^3 - y^3) - b(x^3 - y^3)$

$(a-b)(x^3 - y^3)$

$\boxed{(a-b)(x-y)(x^2 + xy + y^2)}$