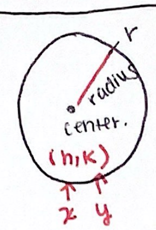
CH. 2.4 circle.



collection of apoint that shares same distance from center.

Standard form

radius $\Rightarrow r$ center at (h,k) (reverse sign)

$(x-h)^2+(y-k)^2=r^2$

example center at $(-3,2)$, $r=5$

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

- center at $(0,0)$, r

$x^2+y^2=r^2$

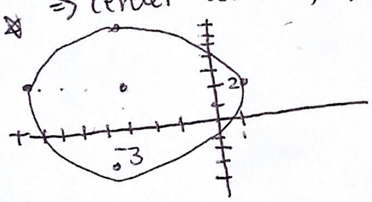
- unit circle (circle center at $(0,0)$, $r=1$)

$\boxed{x^2+y^2=1^2}$

example Graph

$(x+3)^2+(y-2)^2=16$

$\Rightarrow$ center at $(-3,2)$, $r=4$



- Graph the equation.

$x^2+y^2+4x-6y+12=0$

$\Rightarrow \boxed{x^2+4x+\boxed{4}}-\boxed{4}+\boxed{y^2-6y+\boxed{9}}-\boxed{9}+12=0$

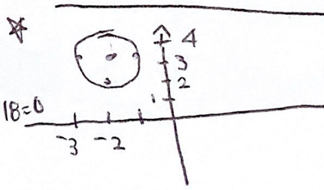
$\frac{4}{2}=2$ square $\quad \frac{-6}{2}=-3$ square

$(x+2)(x+2)$ $\quad (y-3)(y-3)$ $\quad \underbrace{4-9+12}=0$

$(x+2)^2+(y-3)^2=1$

center $(-2,3)$

$r=1$



example

$x^2+y^2-6x+10y+18=0$

$x^2-6x+\boxed{9}-\boxed{9}+y^2+10y+\boxed{25}-\boxed{25}+18=0$

$-6/2$ $\quad 5^2$

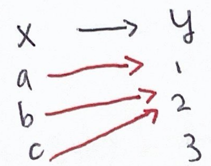
$(x-3)^2+(y+5)^2\underbrace{-9-25+18}_{-16}=0$

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

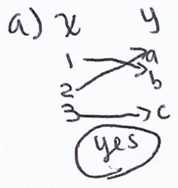
$\boxed{\text{center} = (3,-5) \quad r=4.}$

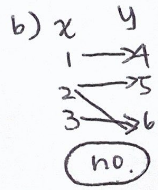
CH 3.1 Functions : Basic Definition.

Definition Let χ and Y be two non empty sets.
A function from χ into Y is a relation that associates w/ each element of χ exactly one element of Y.



ex. Function or not?





example : Determine if the following equation define y as function of x.

a) $y = 2x+1$

$\Rightarrow x=1 \Rightarrow y=3. \rightarrow$ function.

b) $x^2+y^2=1$

$\Rightarrow y^2 = 1-x^2 \Rightarrow \sqrt{y^2} = \sqrt{1-x^2}$

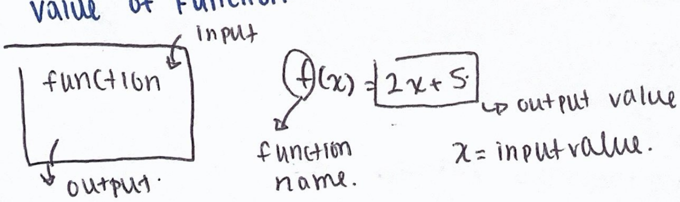
$(y^2)^{1/2}$

test $x=0 \Rightarrow$ $y = \pm\sqrt{1-x^2}$

$x=0 \to$ $y=1$, $y=-1$ $y=\pm 1$ (not of function).

CH 3.1 Functions : Evaluate Functions.

Finding value of Function.



example let $f(x) = 2x^2 - 3x$, evaluate

a) $f(1)$ input value $= 2(1)^2 - 3(1)$

$\cancel{4-3}$ $= \boxed{-1}$

$2-3 =$

b) $f(a) = 2a^2 - 3a$.

c) $f(x+h) = 2(x+h)^2 - 3\cdot(x+h)$

$= 2(x^2+2hx+h^2) - 3(x+h)$

$= 2x^2 + 4hx + h^2 - 3x - 3h$

d) $\dfrac{f(x+h) - f(x)}{h}$

$= \dfrac{\cancel{2x^2} + 4hx + h^2 - \cancel{3x} - 3h - (\cancel{2x^2} - \cancel{3x})}{h}$

$= \dfrac{4hx + h^2 - 3h}{h} = \dfrac{\cancel{h}(4x + h - 3)}{\cancel{h}}$

$= \boxed{4x+h-3}$

CH 3.1 Functions : Domain of Functions

⇒ possible input values (x)

<u>example</u> $f(x) = x+2$

Domain ⇒ all real numbers

<u>example</u> : find the domain of the following functions.

a) $f(x) = x^5 - 4x^3 + 2x^2 - 17$

Domain = all real numbers.

b) $f(x) = \dfrac{3x}{x-2}$

Domain : all real numbers but $x \neq 2$

c) $f(x) = \dfrac{10x}{x^2-4} \Rightarrow \dfrac{10x}{(x+2)(x-2)}$

Domain : all real numbers but $x \neq -2, x \neq 2$.

d) $f(x) = \sqrt{x-3}$ ≥ 0

$x - 3 \geq 0$ $\boxed{x \geq 3}$

Domain : $\{x \mid x \geq 3\}$ *

$+, -, \times, \div$ between functions

<u>example</u> : let f and g be two functions defined as

$f(x) = \dfrac{1}{x+2}$, $g(x) = \dfrac{x}{x-1}$

a) $(f+g)(x) = f(x) + g(x)$

$= \dfrac{(x-1)}{(x-1)} \dfrac{1}{x+2} + \dfrac{x}{(x-1)} \dfrac{(x+2)}{(x+2)} = \dfrac{x-1+x^2+2x}{(x-1)(x+2)}$

$= \dfrac{x^2+3x-1}{(x-1)(x+2)}$ $\boxed{x \neq 1, x \neq -2}$

b) $(f-g)(x) = f(x) - g(x)$

$$= \frac{(x-1)\,1}{(x-1)(x+2)} - \frac{x\,(x+2)}{(x-1)(x+2)} = \frac{x-1-(x^2+2x)}{(x-1)(x+2)}$$

$$= \boxed{\frac{-x^2-x-1}{(x-1)(x+2)}} = \boxed{\frac{-(x^2+x+1)}{(x-1)(x+2)}} = \boxed{\begin{matrix} x \neq 1 \\ x \neq -2 \end{matrix}}$$

or

c) $(f \cdot g)(x) = f(x) \cdot g(x) = \frac{1}{x+2} \cdot \frac{x}{x-1}$

$$= \boxed{\frac{1x}{(x+2)(x-1)}} \quad \boxed{\begin{matrix} x \neq -2 \\ x \neq 1 \end{matrix}}$$

d) $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{\frac{1}{x+2}}{\frac{x}{x-1}}$

$$= \frac{1}{x+2} \cdot \frac{x-1}{x}$$

$$\boxed{\frac{x-1}{x(x+2}} \quad \boxed{\begin{matrix} x \neq 0 \quad x \neq 1 \\ x \neq -2 \end{matrix}}$$