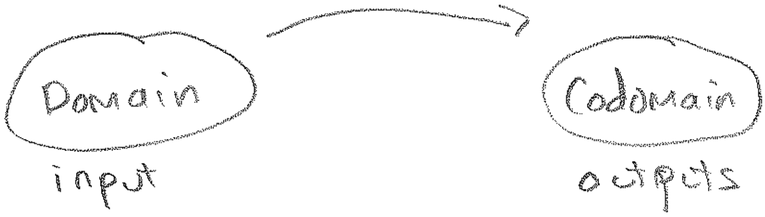
2pm 203

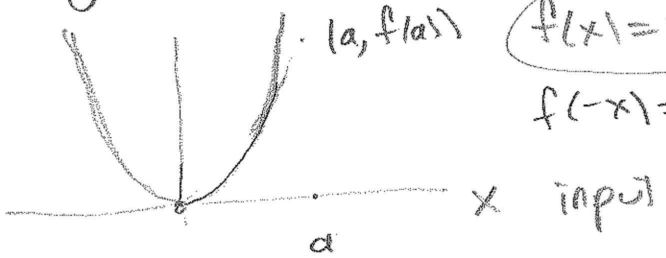
Math Support Center opened 3 Sept.

MATH 1012	MATH 1013	MATH 1023
never had calculus.	regular some exposure to calculus.	honors.

Functions



When these two set are sets of numbers we can graph the function



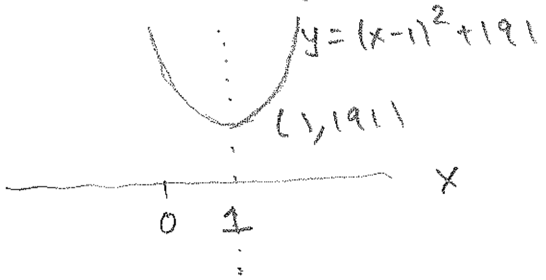
$f(x) = x^2$ domain all numbers

$f(-x) = (-x)^2 = x^2 = f(x)$

WeBWork Assign 1

#7 Complete square of $x^2 - 2x + 192 = (x+A)^2 + B$

$$x^2 - 2x + 192 = (x^2 - 2x + 1) + 191 = (x-1)^2 + 191.$$



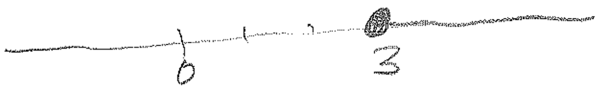
12 Inequality Solve

$$\frac{(x+1)}{12} \geq \frac{(x+1)}{16} + \frac{4}{48}$$

$$\left((x+1)\left(\frac{1}{12} - \frac{1}{16}\right) \geq \frac{4}{48} \right) \text{ multiply by } 48$$

$$(x+1)(4-3) \geq 4$$

$$x+1 \geq 4 \quad \text{so} \quad x \geq 3 .$$



Interval notation $[3, \infty)$

WeBWorK [3, Inf).

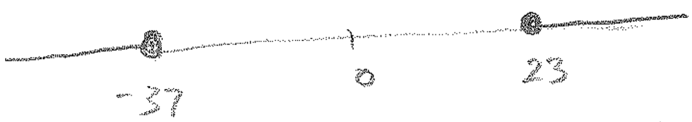
15 Solve $\left|\frac{x+7}{5}\right| \geq 6$

$$|x+7| \geq 6 \cdot 5 = 30$$

$$|x+7| \text{ equals } \begin{cases} x+7 & \longrightarrow \quad x+7 \geq 30, \quad x \geq 23. \\ -(x+7). & \longrightarrow \quad -(x+7) \geq 30, \end{cases}$$

$$(x+7) \leq -30$$

$$x \leq -37$$



$$(-\infty, -37] \cup [23, \infty)$$

#14

$\lvert x-3\rvert > 9$	$(-6, 12)$
$\lvert x-3\rvert \le 9$	$(-\infty, -6] \cup [12, \infty)$
$\lvert x-3\rvert \ge 9$	$(-\infty, -6) \cup (12, \infty)$
$\lvert x-3\rvert < 9$	$\{-6, 12\}$ two elements
$\lvert x-3\rvert = 9$	$[-6, 12]$

$\lvert x-3\rvert > 9$ $\quad x-3 > 9$ OR $-(x-3) > 9$ $\quad 3-9$

$x > 12$ or $-6 > x$

$(-\infty, -6)$ $\quad (12, \infty)$

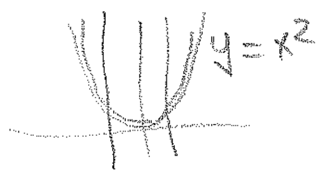
$\lvert x-3\rvert \le 9$ $\quad x-3 \le 9$ OR $-(x-3) \le 9$ $\quad 3-9$

$\underline{x \le 12}$ $\quad \underline{-6 \le x.}$

$\lvert x-3\rvert = 9$ $\quad x-3 = 9$ or $-(x-3) = 9$

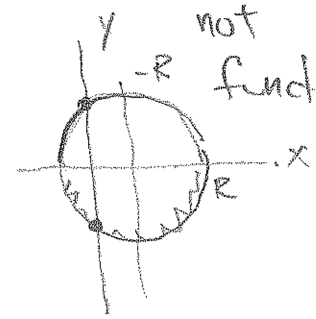
$x = 12$ $\quad -6 = x.$

If domain and codomain of a function are set of numbers, we can graph the function.



function

When is a graph a function?



not function

Example. $\{(x,y) \mid x^2+y^2=R^2\}$

$y^2 = R^2-x^2, \quad y = \pm\sqrt{R^2-x^2}$.

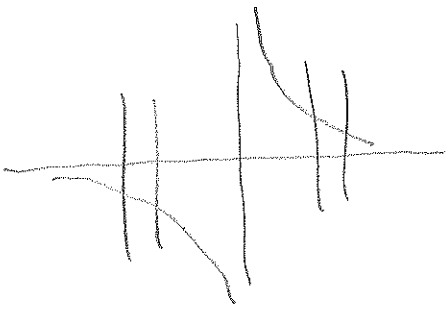
For each input x, there is typically $\underline{2}$ outputs.

Not graph of function.

Actually two functions $y=\sqrt{R^2-x^2}$

$y=-\sqrt{R^2-x^2}$

Vertical Line Test. If we have a graph in plane it is graph of function if each vertical line intersects graph in <u>at most</u> one point.



$\{(x,y) \mid xy=1\}$ hyperbola

$y=\frac{1}{x}$ vertical line $x=0$

Domain of $f(x)=\frac{1}{x}$ is $\{x \mid x\neq 0\}$.

WeBWork Assign 2

\# Find domain of $f(x) = (x^2 - 6x)^{1/4}$

$g(x) = (13x^2 - 4x)^{1/9}$

Since f involves $(\ )^{1/4}$, the input to $(\ )^{1/4}$ must be ≥ 0 so $x^2 - 6x \geq 0$.

$x(x-6)$

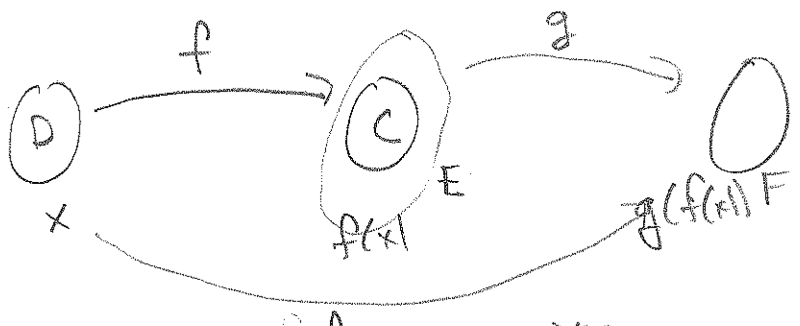
$$\begin{array}{ccccc} + & & - & & + \\ \hline & 0 & & 6 & \end{array}$$

so domain is $(-\infty, 0] \cup [6, \infty)$.

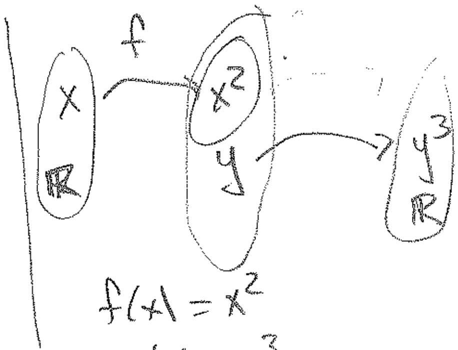
$(\ )^{1/9}$ any input is allowed.

Means g has domain $(-\infty, \infty)$.

Composition of functions



$g \circ f$ = composite function



$f(x) = x^2$

$g(y) = y^3$

$g(f(x)) = (x^2)^3 = x$

#2 $\quad f(x) = \dfrac{1}{x-8}$, domain $x \neq 8$

$g(x) = \dfrac{x-7}{x+8}$, domain $x \neq -8$

Compute formula for $(g \circ f)(x) = g(f(x))$.
and determine domain.

$$x \xrightarrow{\ f\ } \frac{1}{(x-8)} \xrightarrow{\ g\ } \left(\frac{\left(\frac{1}{x-8}\right) - 7}{\left(\frac{1}{x-8}\right) + 8} \right) \boxed{\frac{x-8}{x-8}}$$

equals 1

$$g(f(x)) = \frac{1 - 7(x-8)}{1 + 8(x-8)} = \frac{1 - 7x + 56}{1 + 8x - 64}.$$

$$= \frac{-7x + 57}{8x - 63}.$$

$\dfrac{1}{x-8} = -8$

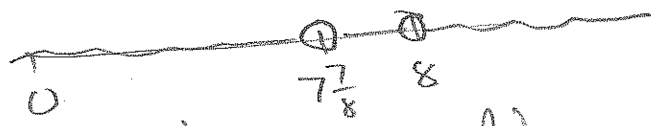
when $-\frac{1}{8} = x - 8$

$x = 8 - \frac{1}{8} = 7\frac{7}{8}.$

Domain $\quad$ f cannot accept $x = 8$.

g cannot accept input -8

so domain $x \notin \{8, 7\frac{7}{8}\}$



$(-\text{Inf}, \frac{63}{8}) \cup (\frac{63}{8}, 8) \cup (8, \text{Inf}).$

output of f to input x is $\dfrac{1}{x-8} = -8$

solution is $7\frac{7}{8}$