Lesson 8

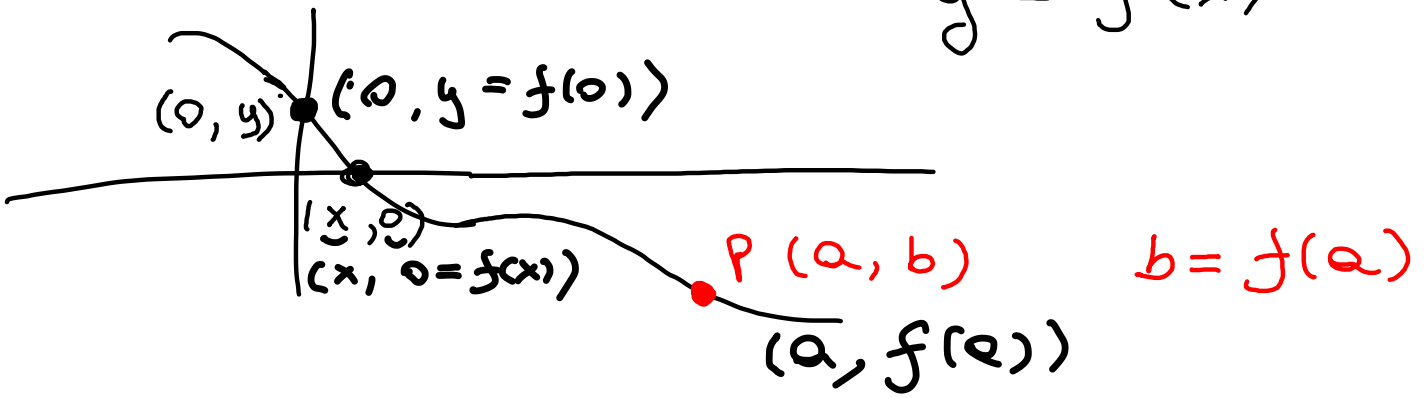
Read Chapter 5 and Chapter 6

Functions,domain range

Multipart functions

semicircles

x and y intercepts



Given $y = f(x)$

To find y intercept calculate $f(0)$, if 0 is in domain of f

To find x intercept(s) set $f(x) = 0$ and solve for x

There is at most 1 y intercept

There can be any number of x intercepts (including none)

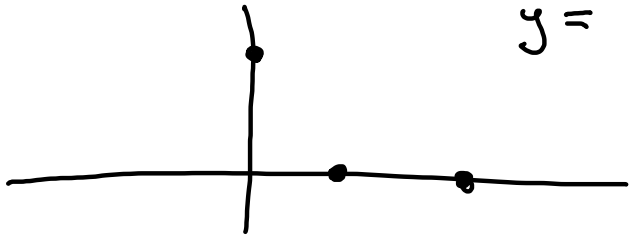
Find x and y intercepts for $f(x) = x^2 - 5x + 6$

$y = x^2 - 5x + 6$

1) For y intercept : $x = 0$ compute $f(0) = 6$ $(0, 6)$

2) For x intercept : $y = 0$ solve $0 = x^2 - 5x + 6$ .... $x = 2, 3$

$(2, 0)$ $(3, 0)$

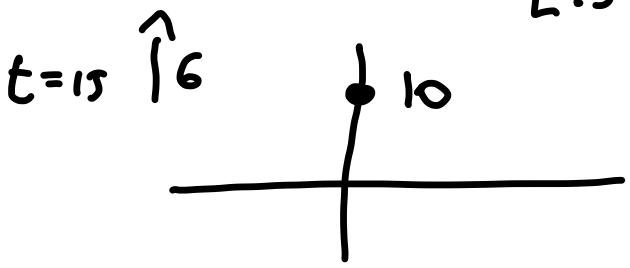


Domain=set of all allowed inputs

allowed by whoever defined the function

If we have a formula y=f(x), NATURAL DOMAIN is all x that I can plug into the formula
but
there maybe other restrictions. Recall Ann and Bob problem:
y(t)=10+6(t-15), t$\geq$ 15

[15, to)



Find the (natural) domain of $f(x) = \frac{\sqrt{x+1}}{x-5}$

All values of x that algebra allows me to plug into formula

$x \neq 5$

$x + 1 \geq 0$

$x \geq -1$

Write domain in interval notation

$[-1, 5) \cup (5, +\infty)$

ADD

+

$\ln\left(\text{EXPR}\right)$ requires $\text{EXPR} > 0$

$\sqrt{\text{EXPR}}$ requires $\text{EXPR} \geq 0$

$\frac{\text{SOMETHING}}{\text{EXPR}}$ requires $\text{EXPR} \neq 0$

Algebraic manipulations

Given $f(x) = \frac{\sqrt{x+1}}{x-5}$ calculate $f(1+h)$

replace x with $1+h$

$$f(1+h) = \frac{\sqrt{(1+h)+1}}{(1+h)-5} = \frac{\sqrt{2+h}}{h-4}$$

Given $f(x) = \sqrt{x-8}$ simplify $\frac{f(x+h)-f(x)}{h}$ enough so that plugging in $h = 0$ is allowed

$$\cdot \frac{\left(\sqrt{(x+h)-8} - \sqrt{x-8}\right)}{h}$$

$$\cdot \frac{\left(\sqrt{x+h-8} + \sqrt{x-8}\right)}{\sqrt{x+h-8} + \sqrt{x-8}} = 1$$

$$(a-b)(a+b) = a^2 - b^2$$

$$\frac{(x+h-8) - (x-8)}{h\left(\sqrt{x+h-8} + \sqrt{x-8}\right)} = \frac{h \quad 1}{h\left(\sqrt{x+h-8} + \sqrt{x-8}\right)}$$

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

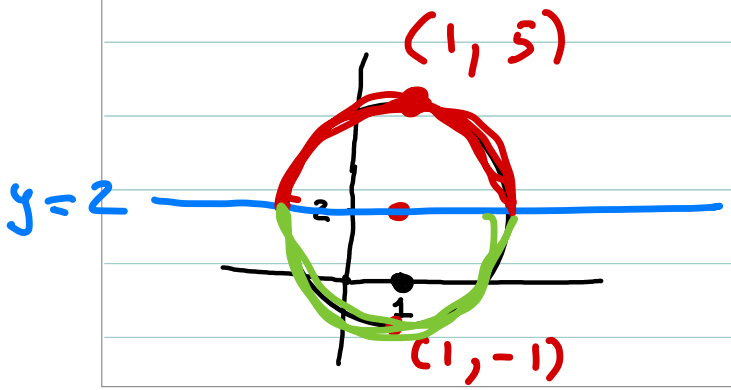
$$(y-2)^2 = 9 - (x-1)^2$$

$$(y-2) = \pm\sqrt{9-(x-1)^2}$$

$$y = 2 \pm \sqrt{9-(x-1)^2}$$

NOT FORMULA FOR A FUNCTION

when $x = 1$ $\quad y = 5, -1$

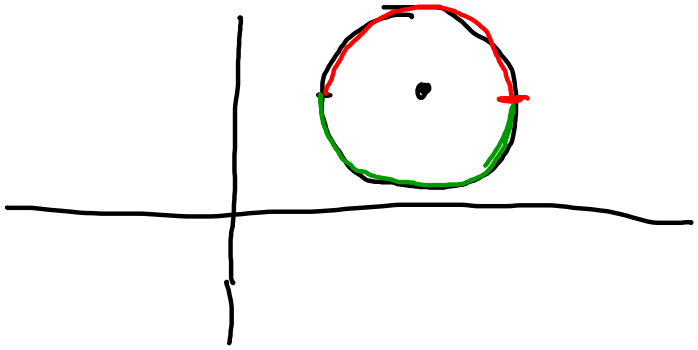


C (1, 2)

r = 3

$y = 2 + \sqrt{9-(x-1)^2}$

$y = 2 - \sqrt{9-(x-1)^2}$



Given $(x - x_0)^2 + (y - y_0)^2 = r^2$

Top semicircle is $y = y_0 + \sqrt{r^2 - (x - x_0)^2}$

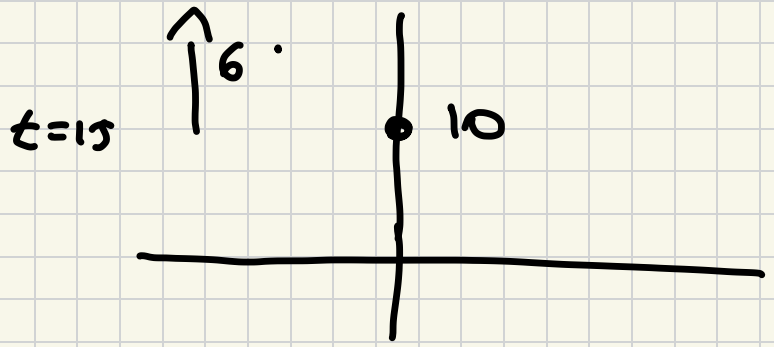
Bottom, semicircle is $y = y_0 - \sqrt{r^2 - (x - x_0)^2}$

Chapter 6: multipart functions.

$$f(x) = \begin{cases} g(x) & \text{if } x \text{ satisfies Cond 1} \\ h(x) & \text{if } x \text{ satisfies cond 2} \end{cases}$$

Ex:

write a function that gives y coordinate of Bob for $t \geq 0$



$$y(t) = \begin{cases} 10 & \text{if } 0 \leq t < 15 \\ 10 + 6(t-15) & t \geq 15 \end{cases}$$