

# Math 112

Q's 1.6 #10

Increase  
open region

where  $f$   $x_1 < x_2$   
 $f(x_1) < f(x_2)$

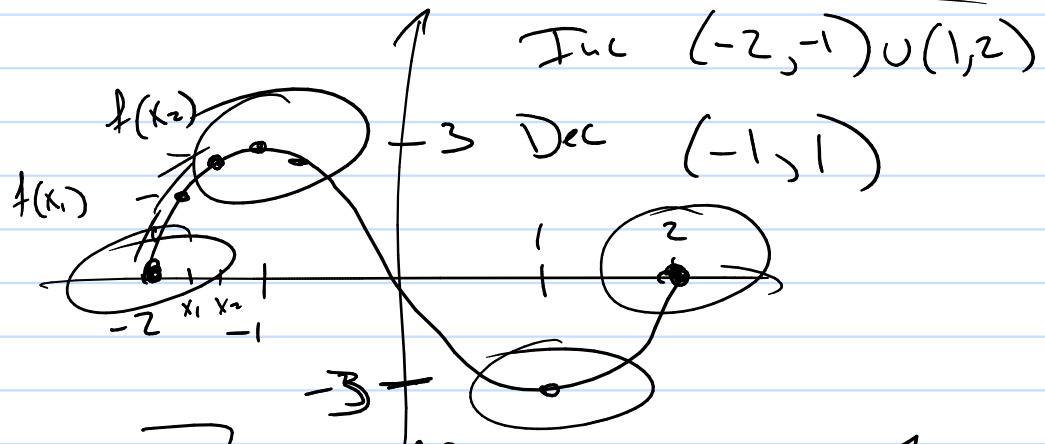
$x_1 < x_2$   
 $f(x_1) > f(x_2)$

going left to right  
function goes up

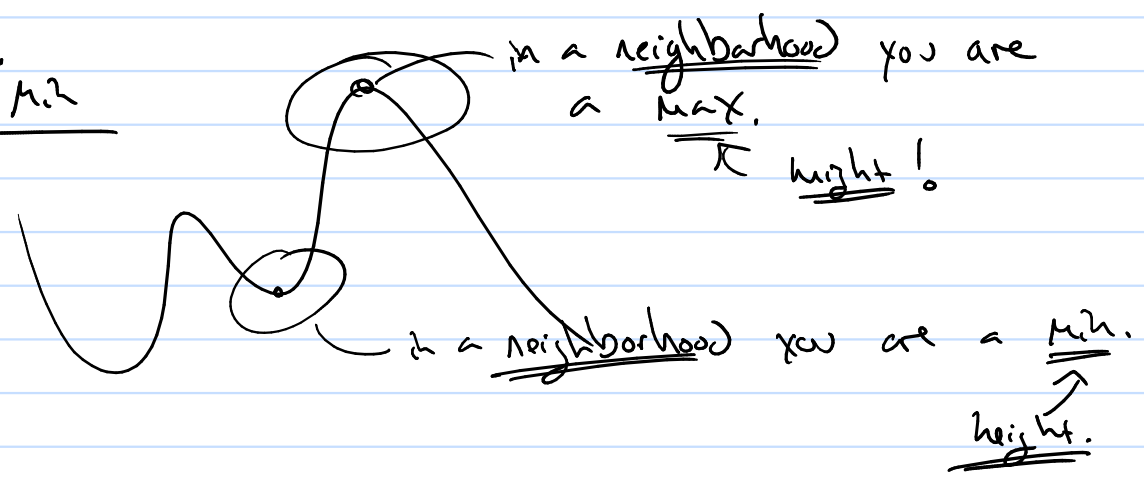
going left to right  
function goes down

Inc

Dec

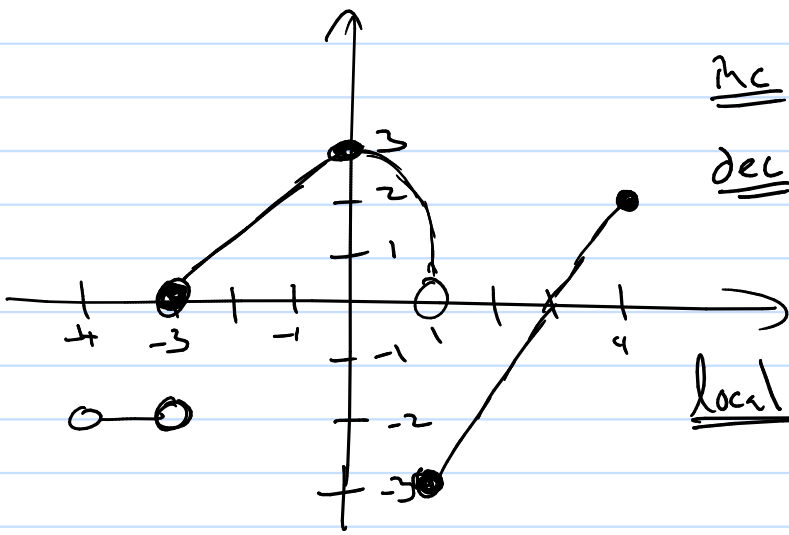


Local Max/Min



Global  
Max/Min

across entire domain you are a Max  
or you are a Min



inc  $(-3, 0) \cup (1, 4)$

dec  $(0, 1)$

local max  $y=3 @ x=0$

$y=2 @ x=1$

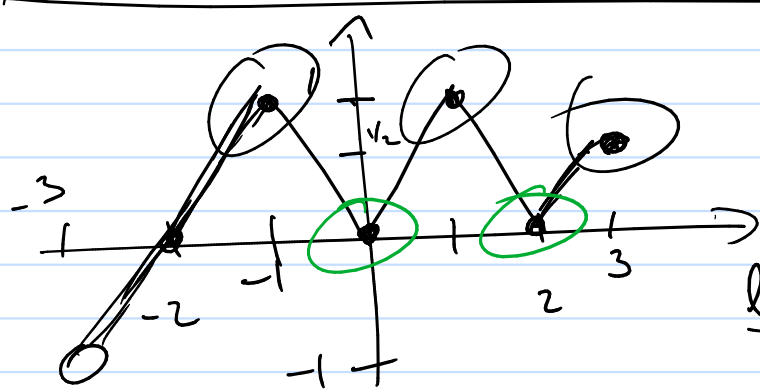
local mins

$y=0 @ x=-3$

$y=-3 @ x=1$

Max:  $y=3 @ x=0$

Min:  $y=-3 @ x=1$



inc  $(-3, -1) \cup (0, 1) \cup (2, 3)$

dec  $(-1, 0) \cup (1, 2)$

local max  $y=1 @ x=-1 \text{ and } x=1$

$y=1/2 @ x=3$

local min

~~$y=-1 @ x=-3$~~

$y=0 @ x=0 \text{ and } x=2$

Max:  $y=1 @ x=-1 \text{ and } x=1$

Min:  $y=-1 @ x=-3$

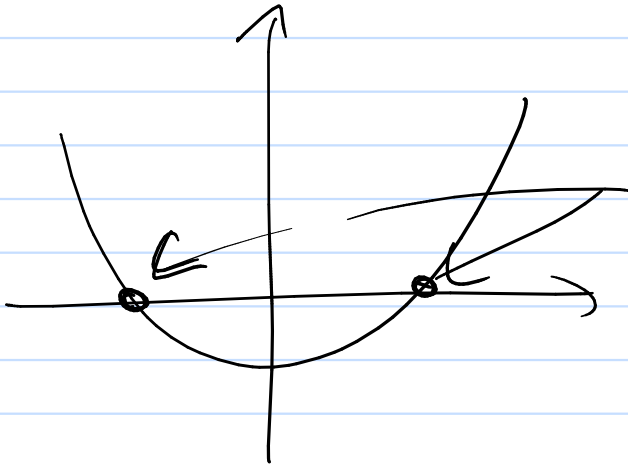
$y_{11}$	$\frac{y_{10}}{y_0}$	$\frac{y_{12}}{y_0}$	1
$y_0$			
$y_2$			1

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \dots = 1$$

# Quadratic Formula:

Quadratic function

$$y = ax^2 + bx + c$$



Zeros of the function

$$0 = ax^2 + bx + c$$

↓ solve by factoring.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\text{or } x = \frac{-b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b}{2a} \oplus \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b}{2a} \ominus \frac{\sqrt{b^2 - 4ac}}{2a}$$

(ex)  $0 = 10x^2 + 3x + 4$

$$x = \frac{-3}{2(10)} + \frac{\sqrt{9 - 4(10)(4)}}{2(10)}$$

$$x = -\frac{3}{2} - \frac{\sqrt{-7}}{2}$$

$$x = -\frac{3}{2} + \frac{\sqrt{-7}}{2}$$

$$= -\frac{3}{2} + \frac{\sqrt{7}}{2}i$$

$$= -\frac{3}{2} - \frac{\sqrt{7}}{2}i$$

Practice factory?

$$(2x-1)(x+3) = 2x^2 + 6x - x - 3$$

$$2x^2 + 5x - 3$$

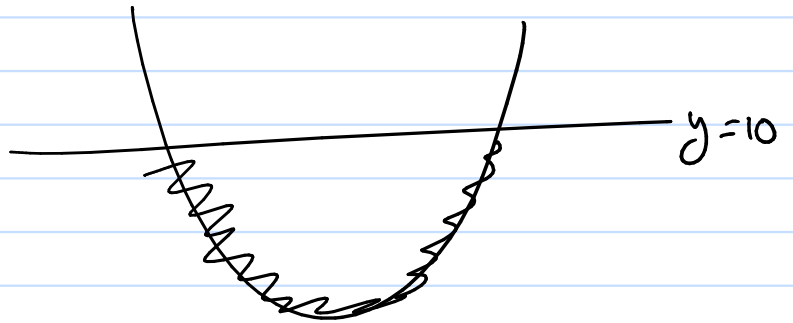
$$(3x+2)(2x-4)$$

$$(4x)(9x)$$

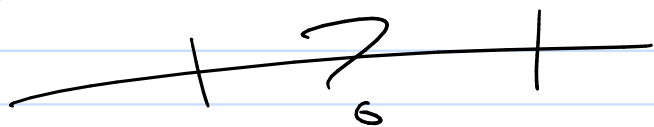
Absolute Value, Linear, Quadratic Inequalities

Idea:

$$3x^2 + 2x - 7$$



$$3x^2 + 2x - 7 < 10$$



Know:

(1)  $|x| < c$



(a) is  $c$  negative?  $|x| < -4$

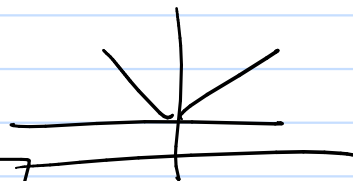
no solution

(b) is  $c$  positive?

$-c < x < c$

$-c < x$  or  $x < c$

(2)  $|x| > c$

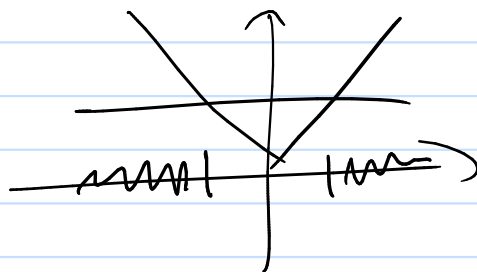


(a) is  $c$  neg?

$-\infty < x < \infty$

(b) is  $c$  pos?

$x < -c$  or  $x > c$



Linear:

(ex)  $3x + 2 < 0$

(goal: get  $x$  alone)

$-3x < -2$

$x < -2/3$

(ex)  $-3x + 2 < 0$

$\frac{-3x}{-3} < \frac{-2}{-3}$

$x > 2/3$

mult. or div. by neg.  
→ change sign direction

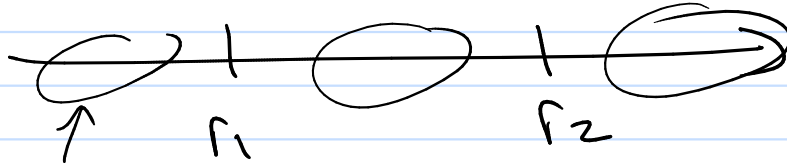
## Quadratics

## Inequalities



- ① Set one side to zero
- ② find the zeros (factor? quad. formula?)  $\leftarrow$

③



Pick a test value and check original ineq.