02-17-25 MTH 161-C06N

1.6 Graphs of Functions

1.6.2 Exercises

page 107: 1, 7, 9, 14, 21, 24, 32, 75

Exam 1		stem & leaf		
39.25	mean			A-0
28.5	median			B-0
19.66013	st. dev	7	26	C-2
15	min	6	6	D-1
76	max	5		F- 9
12	count	4	4	
		3	4	
		2	577889	
		1	5	

1.6

Memorize

The Fundamental Graphing Principle for Functions

The graph of a function f is the set of points which satisfy the equation $y = f(x)$. That is, the point (x, y) is on the graph of f if and only if $y = f(x)$.

memorize

Definition 1.9. The **zeros** of a function f are the solutions to the equation $f(x) = 0$. In other words, x is a zero of f if and only if $(x, 0)$ is an x-intercept of the graph of $y = f(x)$.

Memorize

Testing the Graph of a Function for Symmetry

The graph of a function f is symmetric

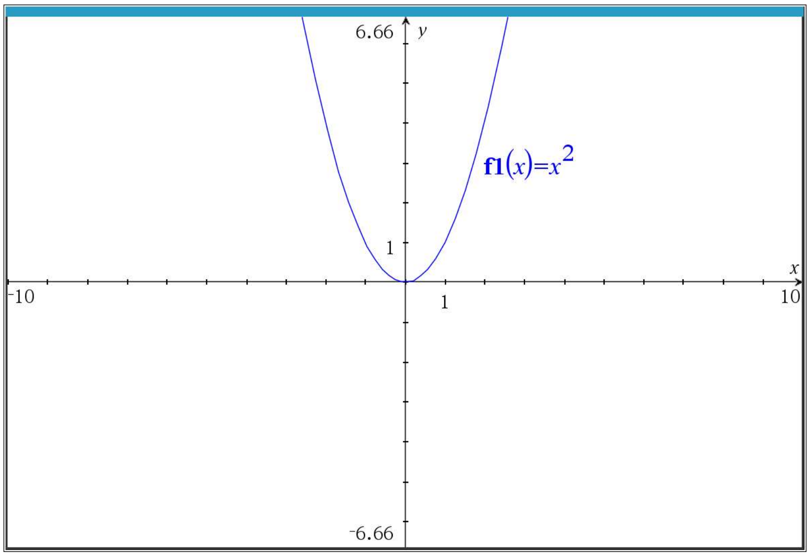
- about the y-axis if and only if $f(-x) = f(x)$ for all x in the domain of f. even
- about the origin if and only if $f(-x) = -f(x)$ for all x in the domain of f. odd

- about the y-axis if and only if $f(-x) = f(x)$ for all x in the domain of f. even
- about the origin if and only if $f(-x) = -f(x)$ for all x in the domain of f. odd

$f(x) = x^2$

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

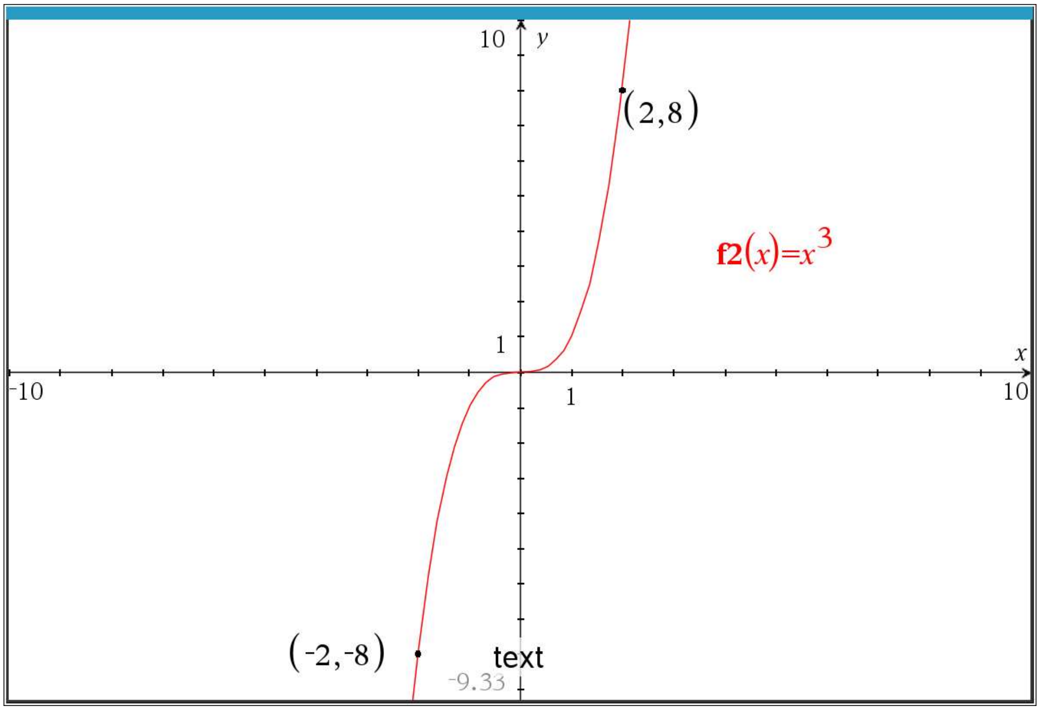
$\therefore f(x)$ is even



$g(x) = x^3$

$g(-x) = (-x)^3 = (-1)^3 x^3 = -x^3 = -g(x)$

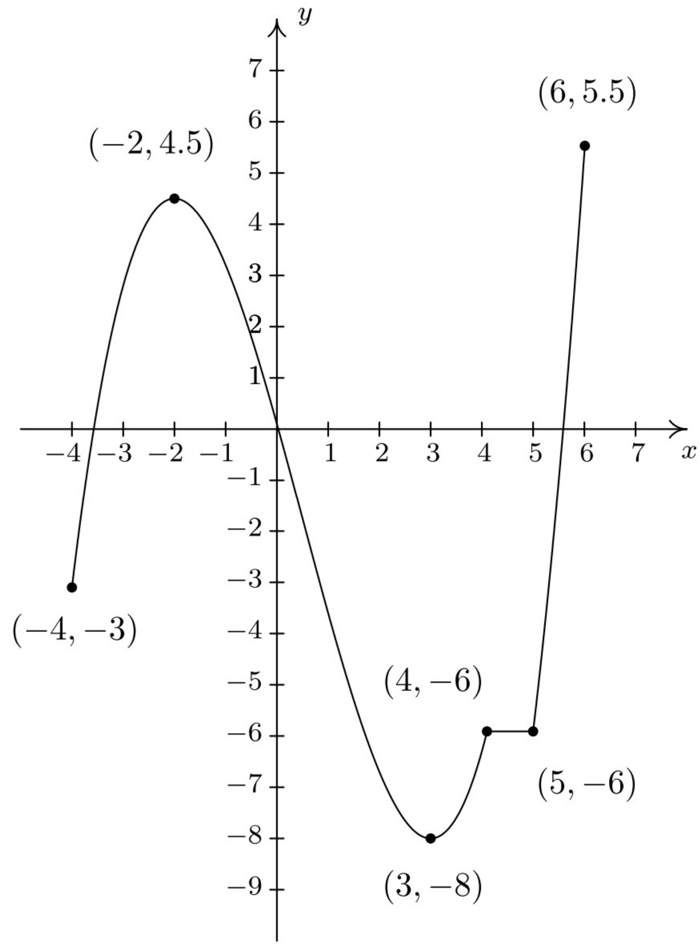
$\therefore g(x)$ is odd (origin symmetry)



Memorize

Definition 1.10. Suppose f is a function defined on an interval I. We say f is:

- **increasing** on I if and only if $f(a) < f(b)$ for all real numbers a, b in I with $a < b$.
- **decreasing** on I if and only if $f(a) > f(b)$ for all real numbers a, b in I with $a < b$.
- **constant** on I if and only if $f(a) = f(b)$ for all real numbers a, b in I.



The graph of $y = f(x)$

increasing on intervals $(-4, -2)$

$(3, 4)$,

$(5, 6)$

decreasing on interval $(-2, 3)$

constant on interval $(4, 5)$

Memorize

Definition 1.11. Suppose f is a function with $f(a) = b$.

relative

- We say f has a **local maximum** at the point (a, b) if and only if there is an open interval I containing a for which $f(a) \geq f(x)$ for all x in I. The value $f(a) = b$ is called 'a local maximum value of f' in this case.

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relative

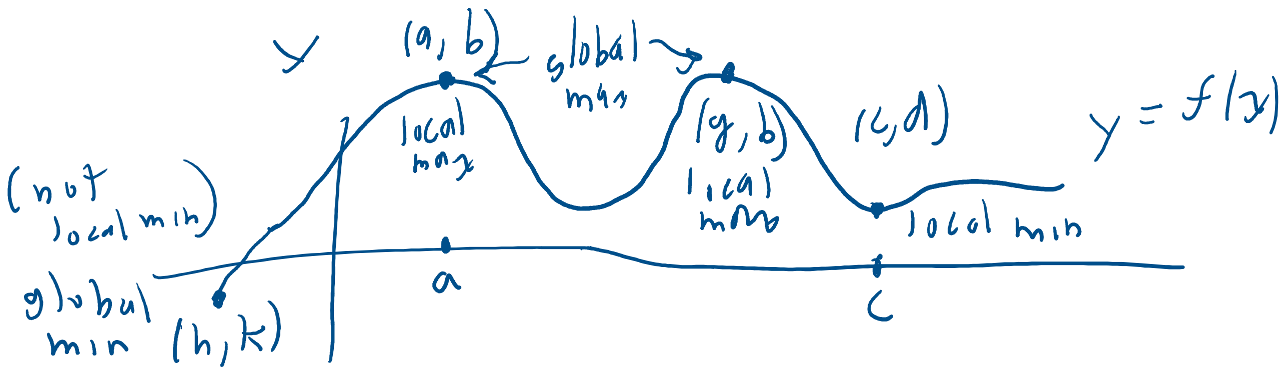
- We say f has a **local minimum** at the point (a, b) if and only if there is an open interval I containing a for which $f(a) \leq f(x)$ for all x in I. The value $f(a) = b$ is called 'a local minimum value of f' in this case.

global (absolute)

- The value b is called the **maximum** of f if $b \geq f(x)$ for all x in the domain of f.

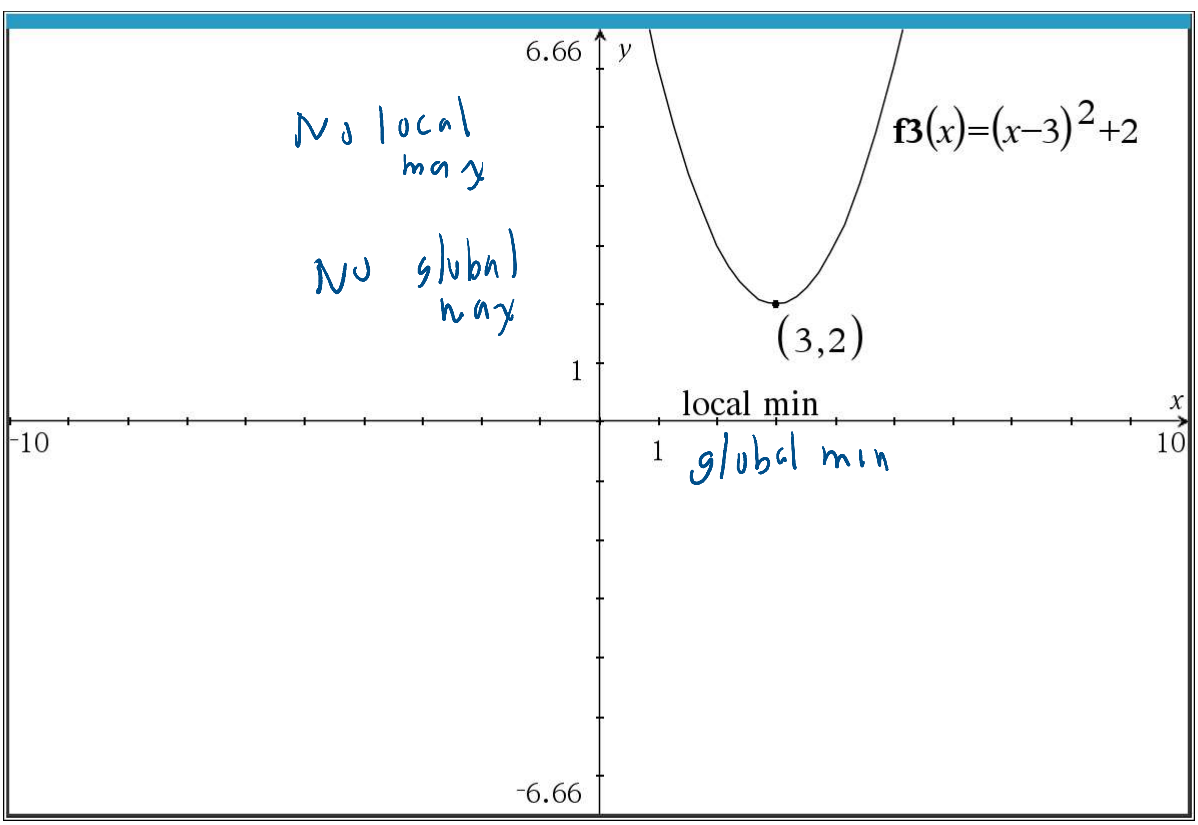
global (absolute)

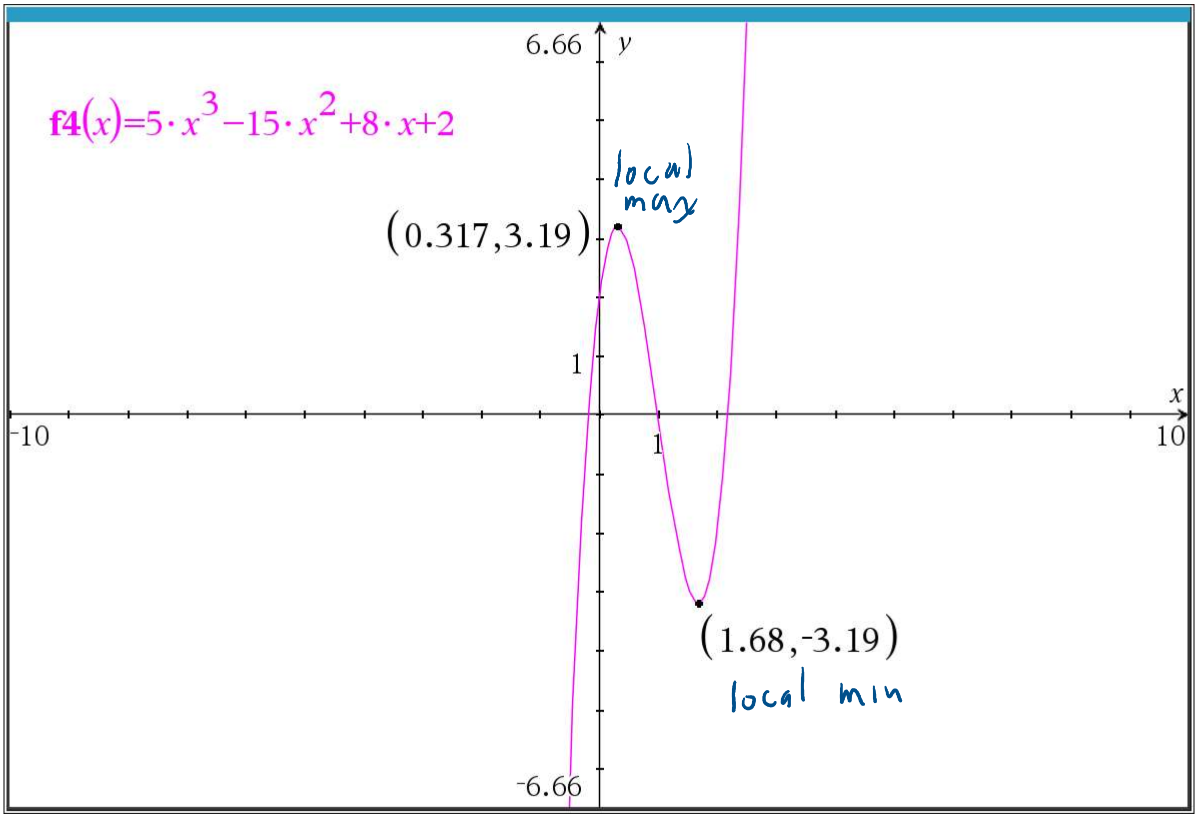
- The value b is called the **minimum** of f if $b \leq f(x)$ for all x in the domain of f.



local max = top of small hill

local min = bottom of a small valley.





Using calculus

$15x^2 - 30x + 8 = 0$, Solution is: $\frac{1}{15}\sqrt{7}\sqrt{15} + 1, 1 - \frac{1}{15}\sqrt{7}\sqrt{15}$

$\frac{1}{15}\sqrt{7}\sqrt{15} + 1 \approx 1.6831$

$1 - \frac{1}{15}\sqrt{7}\sqrt{15} \approx 0.31687$