09-18-25 MTH 167-002N

Took exam 1

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2.2 Absolute Value Functions
    2.2.1 Exercises
    page 183 (165): 1, 2, 15, 17, 22, 29

2.3 Quadratic Functions
    2.3.1 Exercises
    page 200 (212): 1, 4, 11, 21, 26

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Simplify and find the domain of (f/g)(x).

17. $f(x) = \frac{x}{2}$ and $g(x) = \frac{2}{x}$

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$$

$$= \frac{\frac{x}{2}}{\frac{2}{x}} = \frac{x^2}{4}$$

simplified

$x = 0 \Rightarrow$ division by zero

- $\left(\frac{f}{g}\right)(x) = \frac{x^2}{4}$

Domain: $(-\infty, 0) \cup (0, \infty)$

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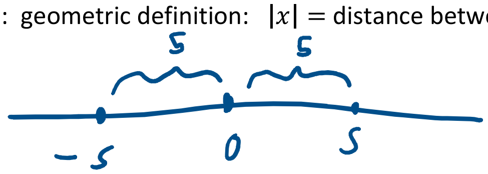
2.2

Memorize: geometric definition: $|x|$ = distance between x and 0 on the real number line.



$|-5| = |5| = 5$

Memorize

Definition 2.4. The **absolute value** of a real number x, denoted $|x|$, is given by

$$|x| = \begin{cases} -x, & \text{if } \ x < 0 \\ x, & \text{if } \ x \geq 0 \end{cases}$$

$-5 < 0 \Rightarrow$ use top formula

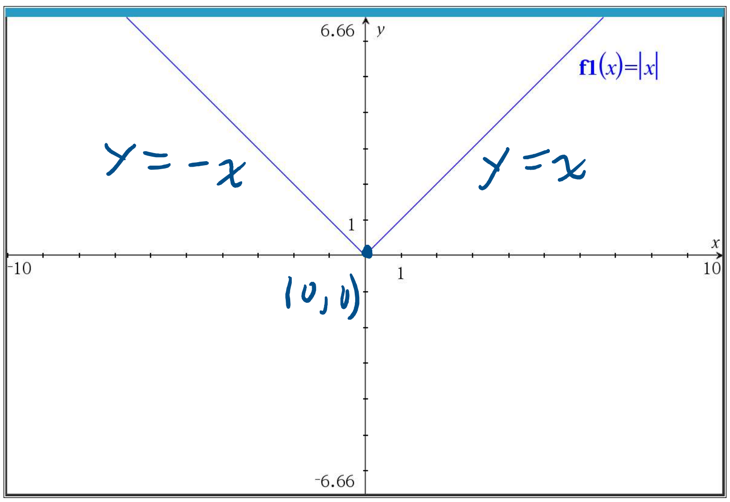
$\Rightarrow |-5| = -(-5) = 5$

$x \geq 0 \Rightarrow$ use bottom formula

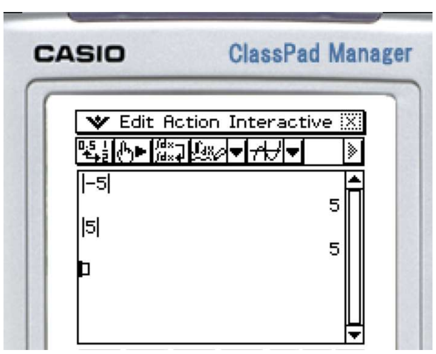
$5 \geq 0 \Rightarrow$ use bottom formula

$\Rightarrow |5| = 5$

TI-84 abs$(x) = |x|$



TI-nspire



Memorize

Theorem 2.1. Properties of Absolute Value: Let a, b and x be real numbers and let n be an integer.[a] Then

- **Product Rule:** $|ab| = |a||b|$
- **Power Rule:** $|a^n| = |a|^n$ whenever a^n is defined
- **Quotient Rule:** $\left|\frac{a}{b}\right| = \frac{|a|}{|b|}$, provided $b \neq 0$

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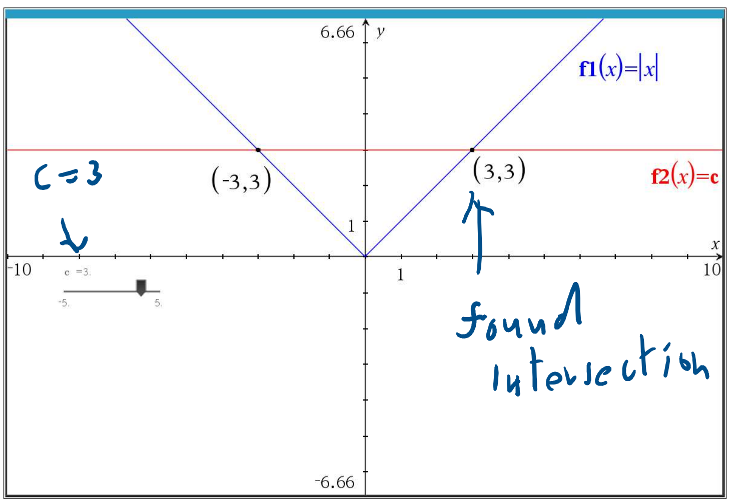
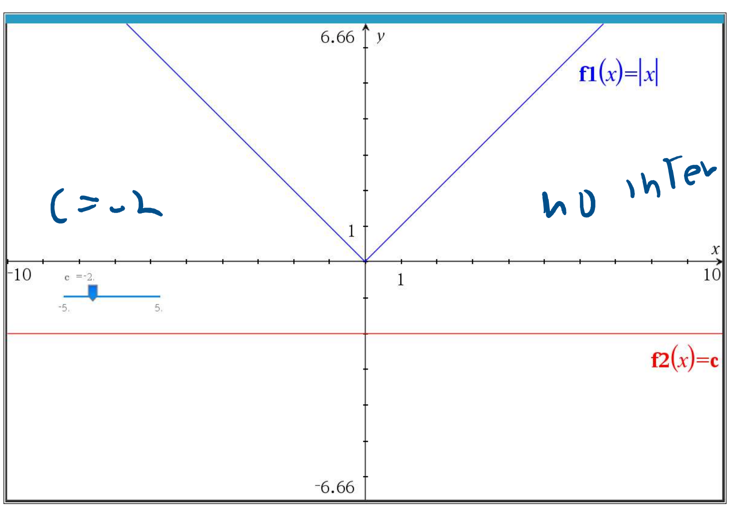
Equality Properties:

- $|x| = 0$ if and only if $x = 0$.
- For $c > 0$, $|x| = c$ if and only if $x = c$ or $-x = c$. $x = \pm c$
- For $c < 0$, $|x| = c$ has no solution.

[a]See page 2 if you don't remember what an integer is.



$y = 3$



no intersection $\Rightarrow |x| = -2$ has <u>no</u> solution

$y = -2$

$$|ab| = |a| \cdot |b|$$

$$|(2)(-3)| = |-6| = 6$$

$$|2| \cdot |-3| = (2)(3) = 6$$

$$6 = 6$$

$\lvert -2\cdot 3 \rvert$	6
$\lvert -2 \rvert \cdot \lvert 3 \rvert$	6

Solve $|5x-4| = -10$

$|5x-4| \geq 0$ for all x

$\therefore$ No solution

$$|5x-4| = 10$$

$$5x-4 = \pm 10$$

$5x-4=-10$

$5x=-6$

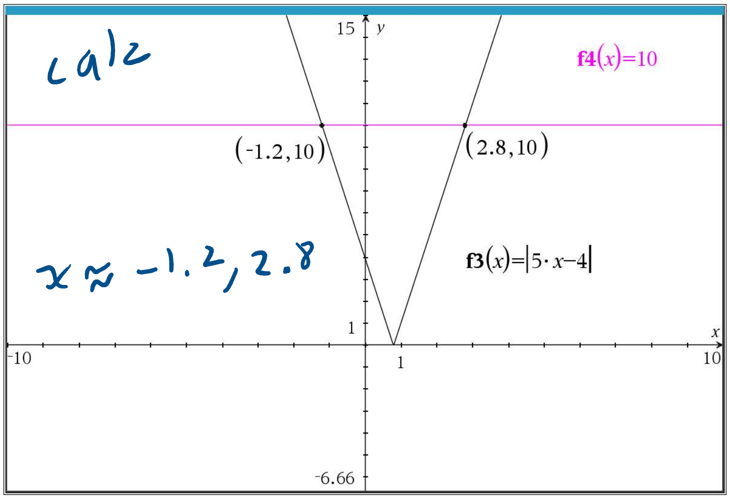
$\boxed{x=-\frac{6}{5}}$

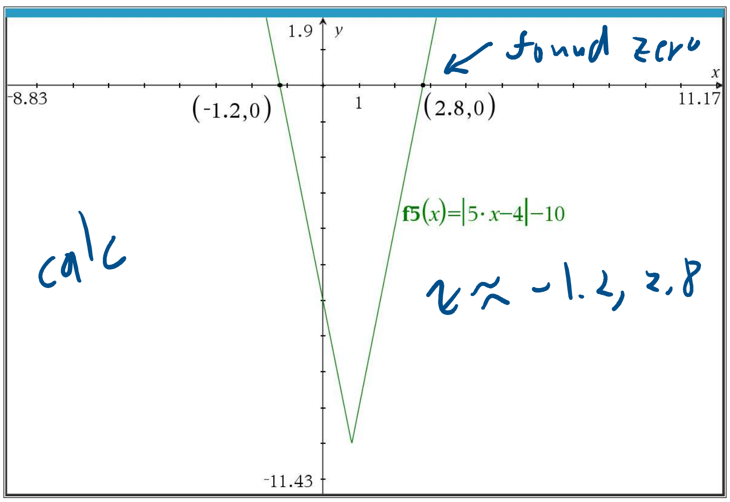
$5x-4=10$

$5x=14$

$\boxed{x=\frac{14}{5}}$

-6/5=-1.2
14/5=2.8





$$a = b \iff a - b = 0$$

Proof

$$a - b = b - b$$

$$a - b = 0$$

2.3

Memorize

Definition 2.5. A **quadratic function** is a function of the form

$$f(x) = ax^2 + bx + c,$$

where a, b and c are real numbers with $a \neq 0$. The domain of a quadratic function is $(-\infty, \infty)$.

Memorize

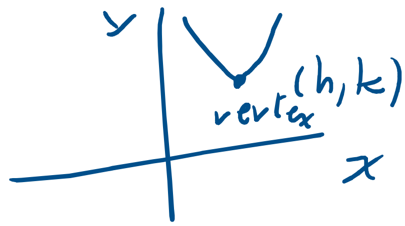
Definition 2.6. Standard and General Form of Quadratic Functions: Suppose f is a quadratic function.

- The **general form** of the quadratic function f is $f(x) = ax^2 + bx + c$, where a, b and c are real numbers with $a \neq 0$.
- The **standard form** of the quadratic function f is $f(x) = a(x-h)^2 + k$, where a, h and k are real numbers with $a \neq 0$. vertex form

Theorem 2.2. Vertex Formula for Quadratics in Standard Form: For the quadratic function $f(x) = a(x-h)^2 + k$, where a, h and k are real numbers with $a \neq 0$, the vertex of the graph of $y = f(x)$ is (h, k).

$$f(h) = a(h-h)^2 + k$$
$$= 0 + k$$
$$= k$$

assume $a > 0$



No zeros

domain $= \{x \mid x \neq 2\}$

domain $= \{x \mid x \neq 2\}$

$= (-\infty, 2) \cup (2, \infty)$

range $= \{-1, 1\}$