03-05-25 MTH 161-C06N

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

2.4 Inequalities with Absolute Value and Quadratic Functions

2.4.1 Exercises
page 220: 1, 8, 17, 34, 36

Exam 2
Thursday, 03/13/25 (changed from Wednesday)
1.6-1.7,2.1 -2.4

2.3.1 Exercises

In Exercises 1 - 9, graph the quadratic function. Find the x- and y-intercepts of each graph, if any exist. If it is given in general form, convert it into standard form; if it is given in standard form, convert it into general form. Find the domain and range of the function and list the intervals on which the function is increasing or decreasing. Identify the vertex and the axis of symmetry and determine whether the vertex yields a relative and absolute maximum or minimum.

5. $f(x) = 2x^2 - 4x - 1$

goal $f(x) = a(x-h)^2 + k$
vertex (h, k)

$f(x) = 2(x^2 - 2x) - 1$

$\left(\frac{1}{2}\right)(-2) = -1$

$(-1)^2 = 1$

$f(x) = 2(x^2 - 2x + 1 - 1) - 1$

$f(x) = 2(x^2 - 2x + 1) - 2 - 1$

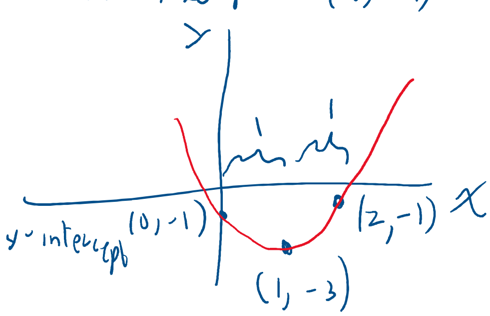
$\boxed{f(x) = 2(x-1)^2 - 3}$

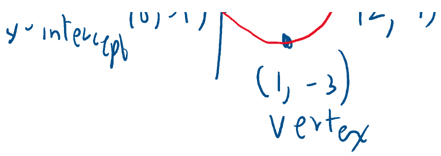
$(p+q)^2$
$= p^2 + 2pq + q^2$

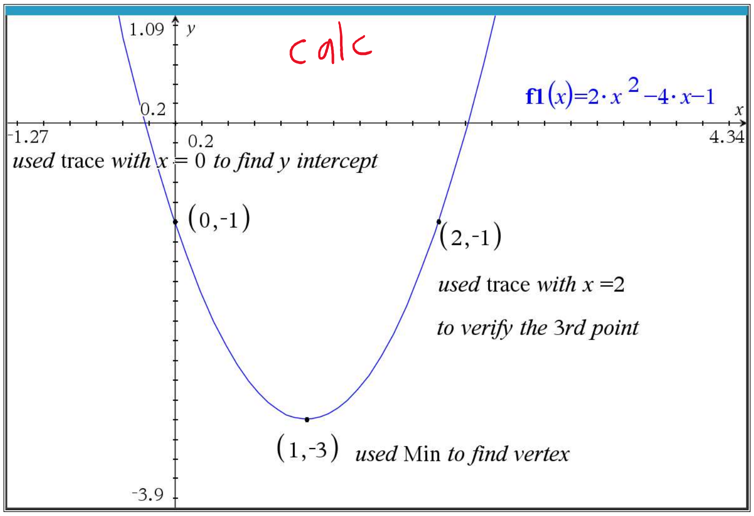
vertex $(1, -3)$

y-intercept
$f(0) = 2(0^2) - 4(0) - 1$
$= 0 - 0 - 1$
$= \boxed{-1}$

or the point $(0, -1)$







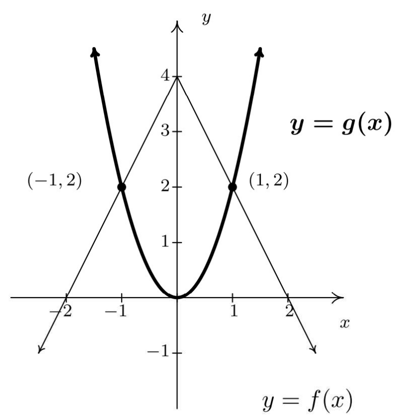
2.4
Memorize

Graphical Interpretation of Equations and Inequalities

Suppose f and g are functions.

- The solutions to $f(x) = g(x)$ are the x values where the graphs of $y = f(x)$ and $y = g(x)$ intersect.
- … y the
- … e the

Example 2.4.2. The graphs of f and g are below. (The graph of $y = g(x)$ is bolded.) Use these graphs to answer the following questions.



1. Solve $f(x) = g(x)$.
2. Solve $f(x) < g(x)$.
3. Solve $f(x) \geq g(x)$.

$\boxed{x = \pm 1}$

$(-\infty, -1) \cup (1, \infty)$

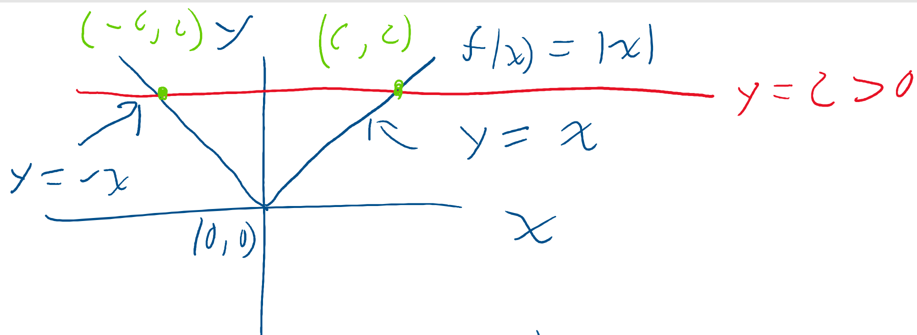
$[-1, 1]$

$f(\pm 1) = g(\pm 1) = 2$

Memorize

Theorem 2.4. Inequalities Involving the Absolute Value: Let c be a real number.

- For $c > 0$, $|x| < c$ is equivalent to $-c < x < c$.
- For $c > 0$, $|x| \le c$ is equivalent to $-c \le x \le c$.
- For $c \le 0$, $|x| < c$ has no solution, and for $c < 0$, $|x| \le c$ has no solution.
- For $c \ge 0$, $|x| > c$ is equivalent to $x < -c$ or $x > c$.
- For $c \ge 0$, $|x| \ge c$ is equivalent to $x \le -c$ or $x \ge c$.
- For $c < 0$, $|x| > c$ and $|x| \ge c$ are true for all real numbers.



solve $|6x - 1| > 10$

- For $c \ge 0$, $|x| > c$ is equivalent to $x < -c$ or $x > c$.

$10 \ge 0$

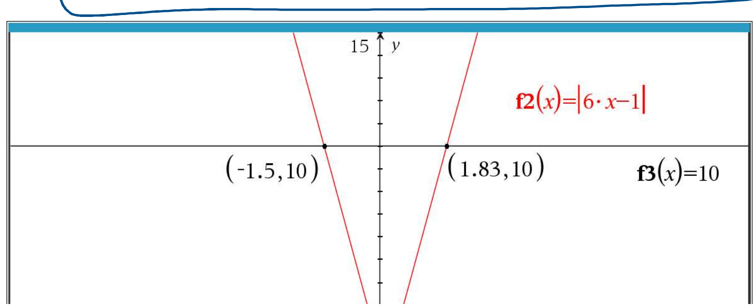
$|6x - 1| > 10 \iff 6x - 1 < -10$ or $6x - 1 > 10$

$6x < -9$ | $6x > 11$

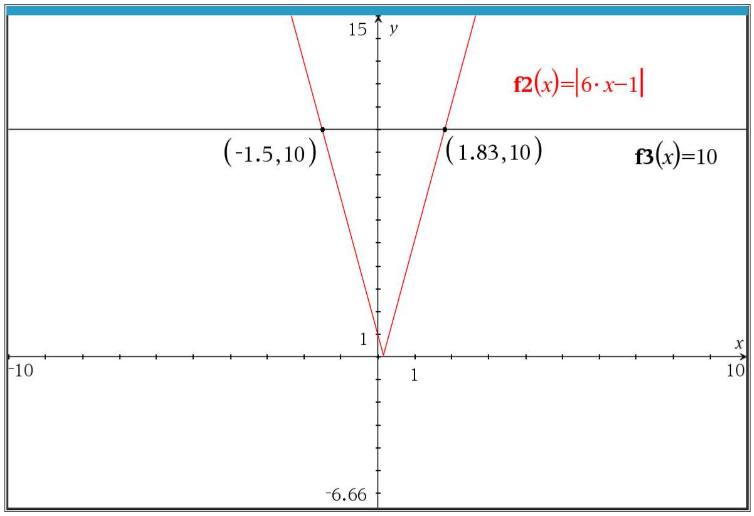
$x < -\frac{9}{6}$

$\boxed{x < -\frac{3}{2}}$ or $\boxed{x > \frac{11}{6}}$

$$\boxed{\begin{aligned}&\text{solution } \{x \mid x < -\tfrac{3}{2} \text{ or } x > \tfrac{11}{6}\} \\ &= \left(-\infty, -\tfrac{3}{2}\right) \cup \left(\tfrac{11}{6}, \infty\right)\end{aligned}}$$

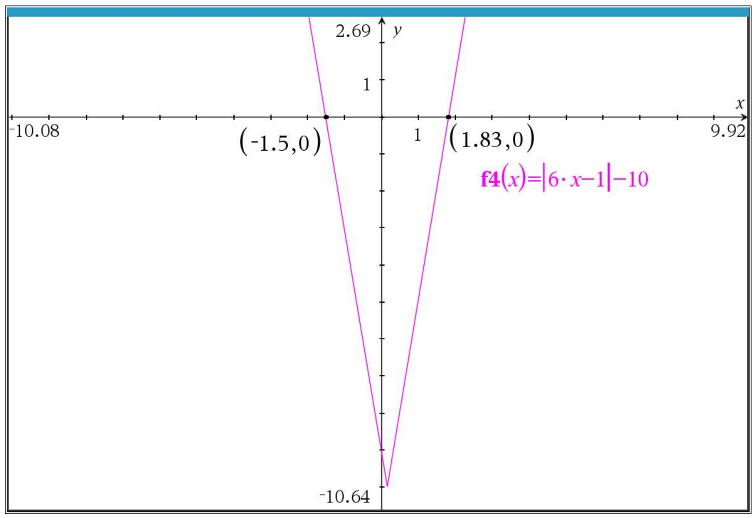


11/6=1.8333



15
y
f2(x)=|6·x−1|
(-1.5,10)
(1.83,10)
f3(x)=10
1
x
-10
1
10
-6.66

11/6=1.8333



2.69
y
1
x
-10.08
(-1.5,0)
1
(1.83,0)
9.92
f4(x)=|6·x−1|−10
-10.64