2.1/2.2M Graphing Piecewise Functions

A. Features

1. The graph may have a "jump" where the formula switches.

2. Drawing the jump correctly:

   (a) At the jump it should look like you have two points lying on top of each other

   (b) Only one of the points that lie on top of each other is actually a "real point"

   (c) Distinguish the "real point":

   The point that is "real", put a solid dot ●
   Fake points put an open circle ○

Thus

means bottom point is real

means top point is real.

B. Graphing Method

1. Make an (x, y) table of points.
2. At any x-value where the formula switches:
   a. plug the x-value into both/all formulas.
   b. write the word "fake" next to the y-value(s) obtained by the "wrong formula".
3. If the "fake" and the correct y-values differ, you get a jump. Fake = open circle and correct = closed dot

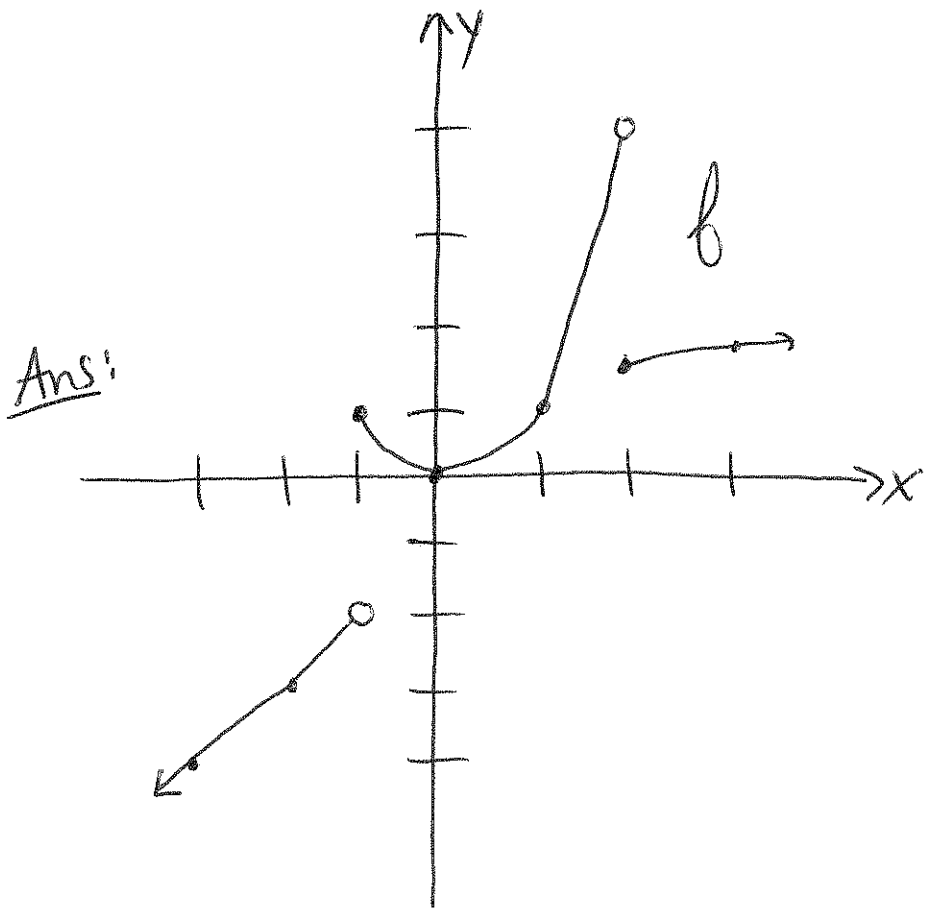
Example1: Graph f, where $f(x) = \begin{cases} x-1; & x<-1 \\ x^2; & -1 \le x < 2 \\ \sqrt{x}; & x \ge 2 \end{cases}$

Solution

Since the graph may jump at $x=1$ and $x=2$, and the formula switches here, we "double-up" our table there

	X	Y	
	-3	4	use $f(x)=x-1$
	-2	-3	
FAKE	-1	-2	
	-1	1	use $f(x)=x^2$
	0	0	
	1	1	
FAKE	2	4	
	2	$\sqrt{2} \approx 1.41$	use $f(x)=\sqrt{x}$
	3	$\sqrt{3} \approx 1.73$	

Ans:



Example 2: Graph f, where $f(x) = \begin{cases} x^2 - 2; & x \le -2 \\ x + 4; & -2 < x \le 1 \\ 3x; & x > 1 \end{cases}$

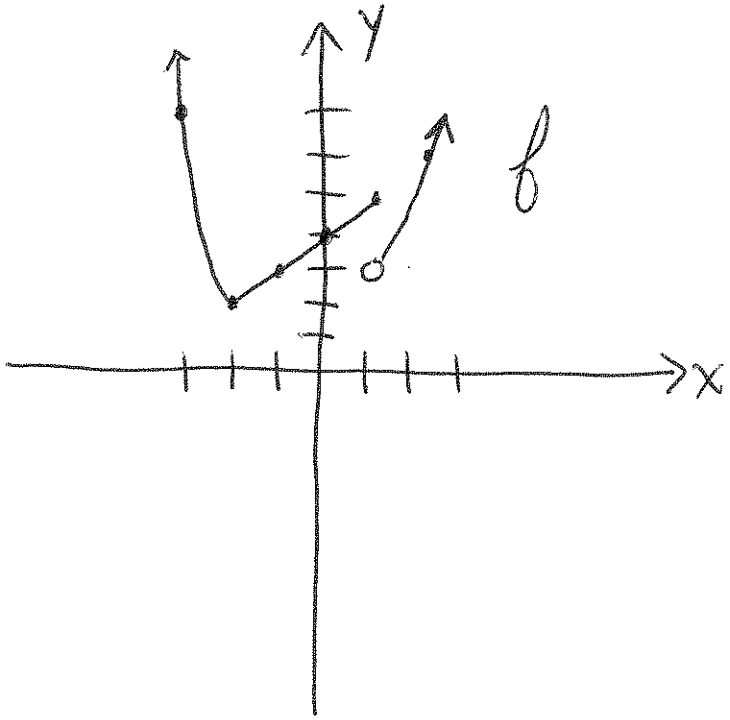
Solution

Here we have additional "fake" entries at -2 and 1

	x	y	
	-3	7	use $f(x) = x^2 - 2$
	-2	2	
FAKE	-2	2	
	-1	3	use $f(x) = x + 4$
	0	4	
	1	5	
FAKE	1	3	use $f(x) = 3x$
	2	6	

Since the real and fake values match at -2, there is no jump at -2

Ans:



Example 3: Graph f, where $f(x) = [\![x]\!]$

Solution

This is actually a sneaky piecewise function with jumps in disguise! There are hidden jumps at every integer value. Strategy: Do many evaluations with fractional/decimal values.

x	y
−2	−2
−1.7	−2
−1.3	−2
−1	−1
−.7	−1
−.2	−1
0	0
.3	0
.8	0
1	1
1.2	1
1.4	1