Transformations of Graphs

What we learned in Algebra II, $y = af(x - h) + k$ may be expanded one step further to include a horizontal stretch or compression and reflections over the y-axis. From the textbook is the table below:

SUMMARY OF GRAPHING TECHNIQUES

To Graph:	Draw the Graph of f and:	Functional Change to $f(x)$
Vertical shifts		
$y = f(x) + k,\quad k > 0$	Raise the graph of f by k units.	Add k to $f(x)$.
$y = f(x) - k,\quad k > 0$	Lower the graph of f by k units.	Subtract k from $f(x)$.
Horizontal shifts		
$y = f(x + h),\quad h > 0$	Shift the graph of f to the left h units.	Replace x by $x + h$.
$y = f(x - h),\quad h > 0$	Shift the graph of f to the right h units.	Replace x by $x - h$.
Compressing or stretching		
$y = af(x),\quad a > 0$	Multiply each y-coordinate of $y = f(x)$ by a. Stretch the graph of f vertically if $a > 1$. Compress the graph of f vertically if $0 < a < 1$.	Multiply $f(x)$ by a.
$y = f(ax),\quad a > 0$	Multiply each x-coordinate of $y = f(x)$ by $\frac{1}{a}$. Stretch the graph of f horizontally if $0 < a < 1$. Compress the graph of f horizontally if $a > 1$.	Replace x by ax.
Reflection about the x-axis		
$y = -f(x)$	Reflect the graph of f about the x-axis.	Multiply $f(x)$ by -1.
Reflection about the y-axis		
$y = f(-x)$	Reflect the graph of f about the y-axis.	Replace x by $-x$.

(handwritten annotation: Movement opposite to sign)

Determine the Function Obtained from a Series of Transformations

Given the parent function: $y = |x|$

1. Shift left 2 units   2) Shift up 3 units.   3) Reflected about the y-axis. *(handwritten: Write parent with these steps)*

$y = |x + 2|$ $y = |x + 2| + 3$ $y = |-x + 2| + 3$

(handwritten: ★ form required for graphing is $f(x - h)$ so we need $+x$)

To graph a transformed function:

* Identify the parent function
* What is being done to the parent? Consider order of operation

Graph: $f(x) = \sqrt{1 - x} + 2 = \sqrt{-(x - 1)} + 2$ ★

(handwritten notes:
① reflection about y-axis
② Horiz shift 1
③ Vertical shift ↑2
final)