In Problems 27–30, find the function that is finally graphed after the following transformations are applied to the graph of $y = \sqrt{x}$.

28. (1) Reflect about the x-axis
(2) Shift right 3 units
(3) Shift down 2 units

Context- 1pt

28. (1) $y = -\sqrt{x}$
(2) $y = -\sqrt{x-3}$
(3) $y = -\sqrt{x-3} - 2$

2pts

29. (1) Reflect about the x-axis
(2) Shift up 2 units
(3) Shift left 3 units

29. (1) $y = -\sqrt{x}$
(2) $y = -\sqrt{x} + 2$
(3) $y = -\sqrt{x+3} + 2$

31. If (3, 0) is a point on the graph of $y = f(x)$, which of the following points must be on the graph of $y = -f(x)$?
(a) (0, 3) (b) (0, −3)
(c) (3, 0) (d) (−3, 0)

2pts

Context - 1pt

31. (c); To go from $y = f(x)$ to $y = -f(x)$ we reflect about the x-axis. This means we change the sign of the y-coordinate for each point on the graph of $y = f(x)$. Thus, the point (3, 0) would remain the same.

32. If (3, 0) is a point on the graph of $y = f(x)$, which of the following points must be on the graph of $y = f(-x)$?
(a) (0, 3) (b) (0, −3)
(c) (3, 0) (d) (−3, 0)

32. (d); To go from $y = f(x)$ to $y = f(-x)$, we reflect each point on the graph of $y = f(x)$ about the y-axis. This means we change the sign of the x-coordinate for each point on the graph of $y = f(x)$. Thus, the point $(3, 0)$ would become $(-3, 0)$.

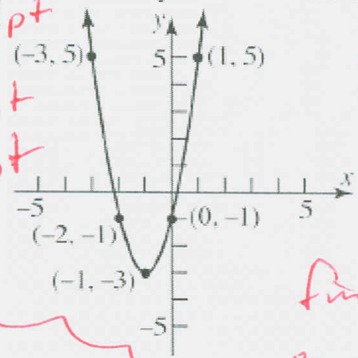
In Problems 35–64, graph each function using the techniques of shifting, compressing, stretching, and/or reflecting. Start with the graph of the basic function (for example, $y = x^2$) and show all stages.

53. $f(x) = 2(x+1)^2 - 3$

53. $f(x) = 2(x+1)^2 - 3$

Using the graph of $y = x^2$, horizontally shift to the left 1 unit, vertically stretch by a factor of 2, and vertically shift downward 3 units.

Context-1pt
Supporting Graphs } 1pt
Final Graph } 1pt

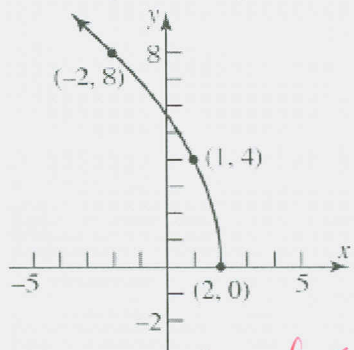


Should be 3 graphs before this final one:
x^2, $2x^2$, $2(x+1)^2$, $2(x+1)^2 - 3$

62. $g(x) = 4\sqrt{2 - x}$

62. $g(x) = 4\sqrt{2-x} = 4\sqrt{-(x-2)}$

Reflect the graph of $y = \sqrt{x}$ about the y-axis, horizontally shift to the right 2 units, and vertically stretch by a factor of 4.



Other method:
$\sqrt{x} \xrightarrow{\text{flip}} \sqrt{-x} \xrightarrow{\text{shift}} \sqrt{-x+2}$
$\to 4\sqrt{2-x}$ = Final.

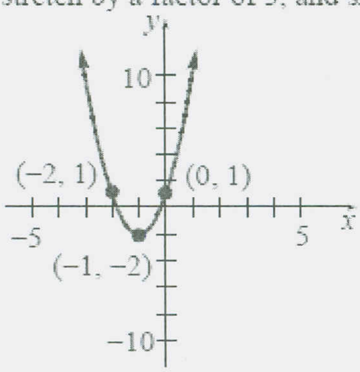
9pts

In #s 75 – 84, complete the square of each quadratic expression. Then graph each function using the technique of shifting. (If necessary, refer to the Appendix, Section A.4, to review completing the square.

83. $f(x) = -3x^2 - 12x - 17$

82.
$$\begin{aligned} f(x) &= 3x^2 + 6x + 1 \\ &= 3(x^2 + 2x) + 1 \\ &= 3(x^2 + 2x + 1) + 1 - 3 \\ &= 3(x+1)^2 - 2 \end{aligned}$$

Using $f(x) = x^2$, shift left 1 unit, vertically stretch by a factor of 3, and shift down 2 units.



Complete square – 1pt
Graphs – 1pt
Final Graph – 1pt
Context – 1pt

4pts