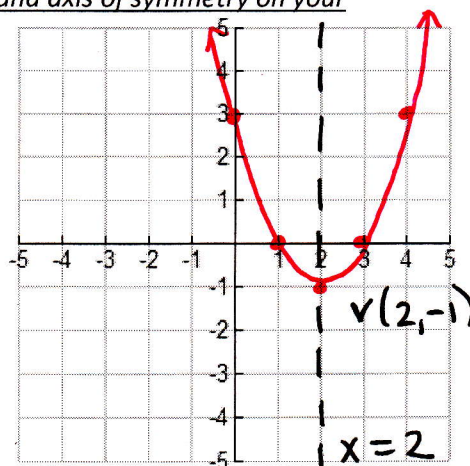Graph $f(x) = x^2 - 4x + 3$ by making a table of values. _Label the vertex and axis of symmetry on your graph._

1.

x	-2	-1	0	1	2	3
y	15	8	3	0	-1	0

$v(2,-1)$

$x = 2$

2. Graph $f(x) = -x^2 - 2x - 2$ by making a table of values. _Label the vertex and axis of symmetry on your graph._
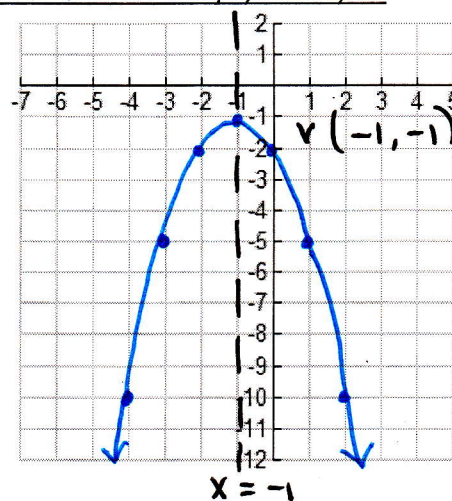
X	-2	-1	0	1	2
Y	-2	-1	-2	-5	-10

$v(-1,-1)$

$X = -1$

Using the graph of $f(x) = x^2$ as a guide, describe the transformations:

3. $h(x) = (-x + 3)^2 - 5$

Reflection y-axis
Horiz. Trans. left 3
Vertical Trans. down 5

4. $g(x) = \frac{1}{2}(x)^2 + 7$

Vertical comp. ½
Vertical Trans. up 7

5. $k(x) = -(3x - 9)^2$

Reflection x-axis
Horizon. comp. by ⅓
Horizon. Trans. right 9

Use the description to write a quadratic function in vertex form:

6. $f(x) = x^2$ is vertically stretched by a factor of 9, reflected across the y-axis, and translated up 8 units.

$g(x) = 9(-x)^2 + 8$

7. $f(x) = x^2$ is reflected across the x-axis, horizontally stretched by a factor of 2, and translated 4 units to the left.

$g(x) = -(½x + 4)^2$

For each function, (a) determine whether the graph opens up or down, (b) find the axis of symmetry, (c) find the vertex, (d) find the y-intercept, (e) identify the domain and range, and (f) determine if the graph has a maximum or minimum. Then graph the function. (_Label your axis of symmetry and vertex_)

8. $f(x) = -4x^2 - 12x - 3$

a. Upward or downward   _down_

b. Axis of symmetry $X = -1.5$

$X = \dfrac{-b}{2a} = \dfrac{-(-12)}{2(-4)} = -1.5$

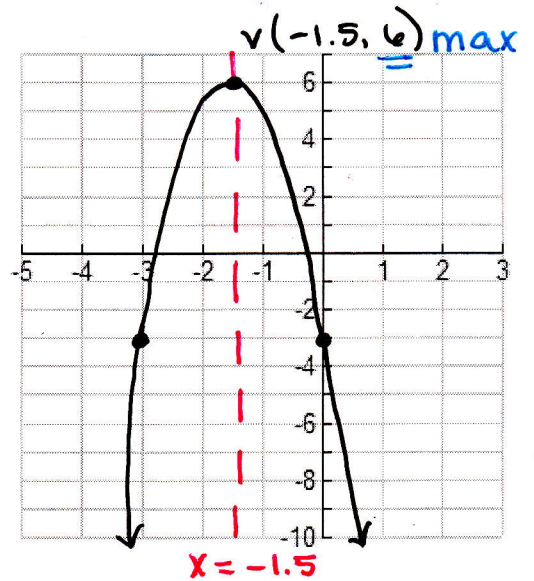c. Vertex $(-1.5, 6)$

d. y-intercept $(0, -3)$

e. Domain/Range   D: $\mathbb{R}$ $(-\infty, \infty)$

R: $y \leq 6$ $(-\infty, 6]$

f. Max or Min   _max_

$v(-1.5, 6)$ max

$X = -1.5$

9. $f(x) = x^2 - 4x + 6$

a. Upward or downward   _up_

b. Axis of symmetry $X = 2$

$X = \dfrac{-b}{2a} = \dfrac{-(-4)}{2(1)} = 2$

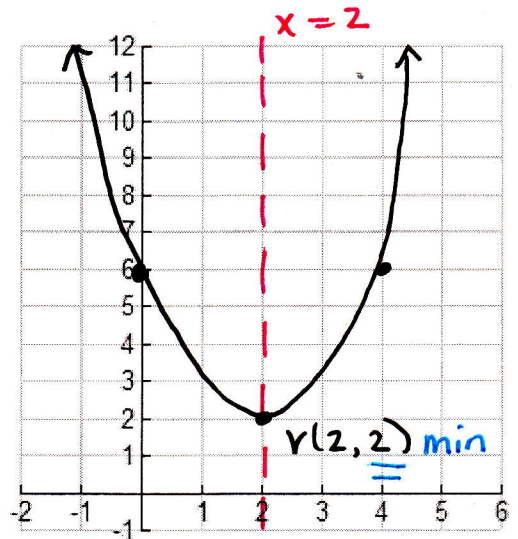c. Vertex $(2, 2)$

d. y-intercept $(0, 6)$

e. Domain/Range   D: $\mathbb{R}$ $(-\infty, \infty)$

R: $y \geq 2$ $[2, \infty)$

f. Max or Min   _min_

$X = 2$

$v(2, 2)$ min

10. The highway mileage m in miles per gallon for a compact car is approximated by $m(s) = -0.025s^2 + 2.45s - 30$, where s is the speed in miles per hour. What is the <u>maximum mileage</u> for the compact car to the nearest tenth of a mile per gallon? What speed results in this mileage? $v(s, m)$

$S = \dfrac{-b}{2a} = \dfrac{-(2.45)}{2(-0.025)} = 49$

$49, 30.025 \rightarrow 30.0$ mi/gal @ 49 mi/h.