

Standard Form of a Quadratic: $ax^2 + bx + c$

Vocab

1. **Quadratic:** An expression where the highest power is 2
2. **Parabola:** the shape of a quadratic graph. Sometimes described as a U shape or an upside down U shape
3. **Axis of Symmetry (AOS):** the invisible line of symmetry that splits into two symmetrical halves
4. **Vertex:** the point where the Axis of Symmetry intersects the graph. It is at the highest or lowest point of the graph
5. **Y-Intercept:** the point where the graph intersects the y-axis.
It is found from the c value in the quadratic equation. (0, c)

Example: $3x^2 - 6x + 8$. The c value is 8, so the **y-intercept is the point (0,8)**

$x^2 + 14x - 25$. The c value is -25 so the **y-intercept is the point (0,-25)**

6. Maximum or Minimum Value:

If the **vertex is at the bottom** of the graph, then the parabola has a **MINIMUM value at the y-coordinate** of the vertex.

If the **vertex is at the top** of the graph then the parabola has a **MAXIMUM value at the y-coordinate** of the vertex

7. Direction of Opening:

If the **arrows are going up** (and vertex is at bottom), we say that the parabola **OPENS UP**.

If the **arrows are going down** (and vertex is at top), we say that the parabola **OPENS DOWN**.

8. Interval Notation: a type of notation which indicates a range of values. A parenthesis means it never actually reaches that value. A bracket [means it does actually reach or touch that value.

For example: $(-10, 4]$ means that there is segment of a graph begins super close to -10 and it ends exactly on 4.

Another example: $[5, \infty)$ means that a the graph begins exactly on 5 and ends at infinity (which actually means that it never ends)

9. Domain: the set of all x values that are graphed. In other words, it describes how far to the left the graph goes, then how far right it goes. For a parabola, the graph goes to the left forever and it goes to the right forever. Note: $-\infty$ means it goes forever in the negative direction, ∞ means it goes on forever in a positive direction.
So the DOMAIN OF ALL PARABOLAS IS $(-\infty, \infty)$.

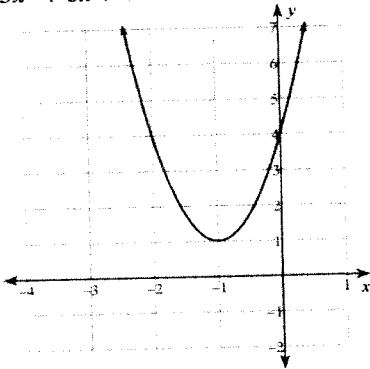
10. Range: the set of all y values that are graphed. It's always described using the lowest value, then the highest value. The range will depend on the vertex, and whether the graph open up or down.

If it opens up, then the range will be $[y, \infty)$

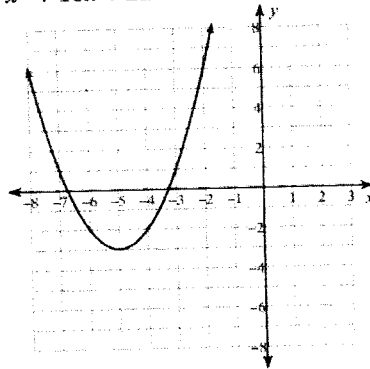
If it opens down, then the range will be $(-\infty, y]$

Examples:

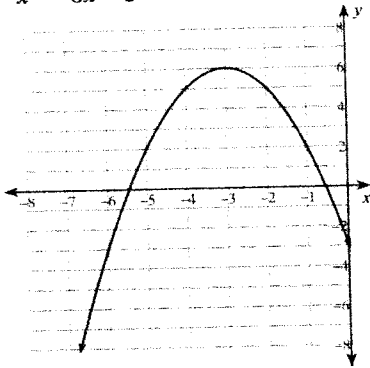
1) $3x^2 + 6x + 4$



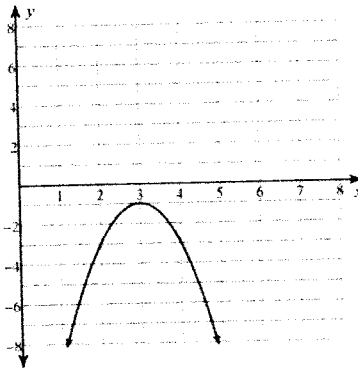
2) $x^2 + 10x + 22$



3) $-x^2 - 6x - 3$



4) $-2x^2 + 12x - 19$



	Vertex	AOS	y-intercept	Max/min & value	Direction of opening	Domain	Range
1	$(-1, 1)$	$x = -1$	$(0, 4)$	min = 1	up	$(-\infty, \infty)$	$[1, \infty)$
2	$(-5, -3)$	$x = -5$	$(0, 22)$	min = -3	up	$(-\infty, \infty)$	$[-3, \infty)$
3	$(-3, 6)$	$x = -3$	$(0, -3)$	max = 6	down	$(-\infty, \infty)$	$(-\infty, 6]$
4	$(3, -1)$	$x = 3$	$(0, -19)$	max = -1	down	$(-\infty, \infty)$	$(-\infty, -1]$