

Date: _____

5.4 Quadratic Models Using Vertex Form

Vertex Form: $y = a(x - h)^2 + k$
 (x, y) → Any point on the graph
 (h, k) → The vertex



You can write equations in vertex form if you are given:

- a list of transformations.
- the vertex and a value for a .
- the vertex and any other point.
- the zeros and a point.

For the first two options, you simply need to be able to sub in the values in the appropriate places.

Ex. 1/ The graph of $y = x^2$ has been stretched vertically by a factor of 8, and shifted 5 units to the left and two units up. Write the equation of the new relation. How many zeros will it have?

Ex. 2/ A quadratic relation with an equation of the form $y = a(x - h)^2 + k$ has been vertically compressed by a factor of 0.25. Its vertex is at $(-4, 7)$. Write the relation.

The other two situations require you to apply skills that you already know.

When you are given the vertex and a point, you must solve for 'a' before you can write the relation in vertex form.

Ex. 3/ A parabola has a vertex at $(2, -3)$ and passes through the point $(3, 8)$. Determine a relation in vertex form to model the parabola.



If you are given the zeros and a point, you must find the vertex, and then sub in the vertex and your point to solve for 'a'.

Ex. 4/ A parabola has zeros at $(-1, 0)$ and $(5, 0)$, and passes through the point $(3, -8)$. Determine a relation in vertex form to represent the parabola.

To write a relation in vertex form in standard form, expand and simplify.

Ex. 5/ Write the relation in Ex. 4 in standard form.

Ex. 6/ The Warm Bread Bakery wants to determine a quadratic relation to model the daily profit from bread sales. They know that they reach a maximum profit of \$400 on days when they sell their bread at a price of \$1.75 per loaf. They also know that when they sell their bread for \$0.75 per loaf they make a profit of \$300. Can you help them write a relation to model this?

