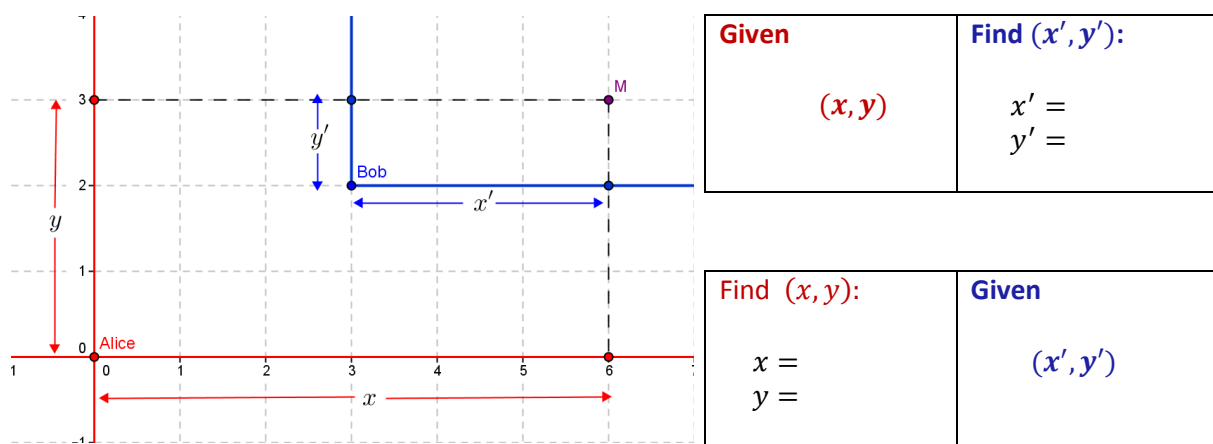


## Quizzical Quadratics

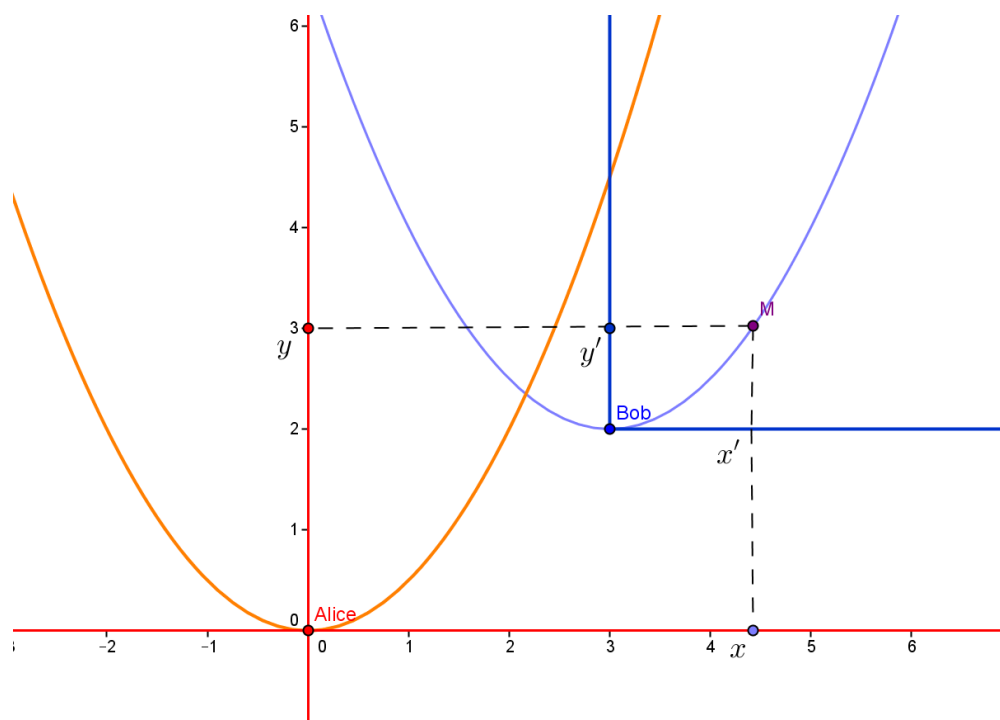
### Preliminaries: Systems of coordinates

a) Alice sees a car 5m East, 2m North from where she's standing. Bob sees the same car 7m East, 5m North of him. Where is Bob in relation with Alice?

b) Alice and Bob each sit at the origin of their own coordinate system. Suppose Bob's coordinates in Alice's coordinate system are  $(h, k) = (3, 2)$ . Alice sees a bird M at the point of coordinates  $(x, y)$ . For Bob, the same bird M has coordinates  $(x', y')$ .





c) Alice draws the parabola of equation  $y = \frac{1}{2}x^2$  in orange. Bob likes it and he draws an identical parabola, but moves it to his place like in this diagram. Write the equation of Bob's parabola in Alice's coordinates  $(x, y)$ .



Assume Bob's coordinates in Alice's system are  $(h, k)$ .

## 2. Quadratic Functions

Standard Form		Vertex Form
$y = ax^2 + bx + c$		$y = a(x - h)^2 + k$
Find $b$ and $c$		Given $a, h, k$
Given $a, b, c$		Find $h$ and $k$

3. a) Vary the parameters  $a, h, k$  in the link below. Can you explain the results?

<https://www.geogebraTube.org/student/m145526>

4. For each of the following equations, find the minimum/maximum values that  $y$  can take when  $x$  is a real number. For which values of  $x$  is the minimum/maximum attained?

a)  $y = x^2 + x$ .

b)  $y = 3x^2 - x + 17$ .

c)  $y = -2x^2 + 6x + 10$ .

5. In the link below, vary the parameters  $b$  and  $c$ . What kind of shapes does the vertex of the parabola trace when  $a, b$  are fixed and  $c$  varies? How about when  $a, c$  are fixed and  $b$  varies?

<https://www.geogebraTube.org/student/m45501>