## 5.9: Problem Solving Given Equations

## Example 1:

A ball is thrown upward from the balcony of an apartment building and falls to the ground. The height of the ball, $h$ metres above the ground after $t$ seconds is given by the function $h(t)=-5 t^{2}+15 t+45$.
a) Determine the maximum height of the ball.

What form of the equation would be helpful here and why? Vertex $\backslash$ Factored $\backslash$ Standard
$h(t)=-5 t^{2}+15 t+45$
b) How long does it take the ball to reach its maximum height?
c) How high is the balcony?

What form of the equation would be helpful here and why? Vertex | Factored I Standard

Example 2:
The stainless steel Gateway Arch in St. Louis, Missouri, has the shape of a catenary, which is a curve that approximates a parabola. If the curve is graphed on a grid with the origin on the ground directly below the top of the arch, the curve can be modeled by the function $h=-0.02 \mathrm{~d}^{2}+192$ where $\boldsymbol{h}$ is the height of the arch in metres, and $\boldsymbol{d}$ is the horizontal distance from the vertex of the arch in metres.
a) Sketch the shape of the arch.
b) Find the maximum height of the arch.
c) Find the approximate width of the arch at the base.
d) Find the approximate height of the arch at a horizontal distance of 15 m from one end.

