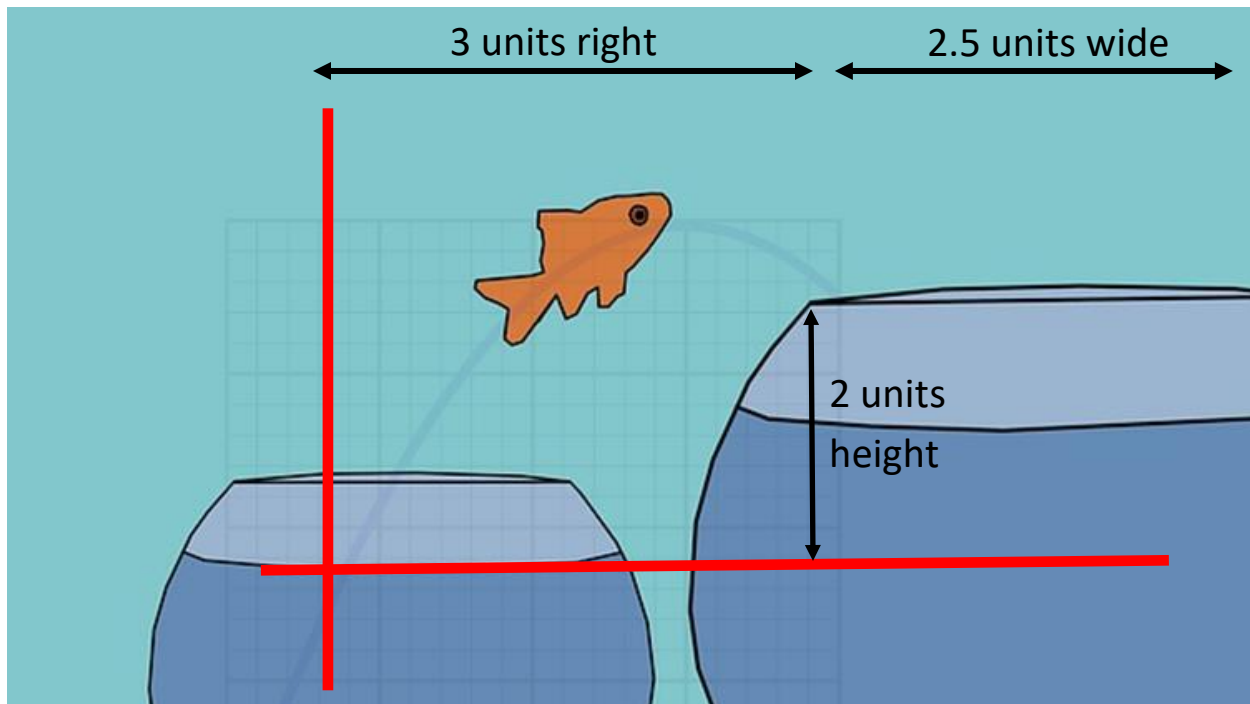


## 1. Will the fish reach the next bowl?

- Jumping point from the lower bowl is the origin (0,0)
- Flight path is parabolic
- Next bowl is 2 units up, 3 units to the right, and 2.5 units wide



a) At [desmos.com/calculator](https://www.desmos.com/calculator) represent the upper bowl:

$$y = 2 \{3 < x < 6.5\}$$

b) Which flight paths cross the above line segment? Restrict to  $\{y > 0\}$ .

$$f(x) = -(x - 1)^2 + 1$$

$$f(x) = -\frac{1}{2}(x - 1)^2 + \frac{1}{2}$$

$$f(x) = -(x - 2)^2 + 4$$

$$f(x) = -\frac{1}{2}(x - 2)^2 + 2$$

$$f(x) = -(x - 3)^2 + 9$$

$$f(x) = -\frac{1}{2}(x - 3)^2 + \frac{9}{2}$$

$$f(x) = -(x - 4)^2 + 16$$

$$f(x) = -\frac{1}{2}(x - 4)^2 + 8$$

2. Plot the parabolas on a computer to determine what the parameters  $a$ ,  $h$ , and  $k$  represent graphically.

$$y = a(x - h)^2 + k$$

$$f(x) = 1(x - 0)^2 + 0$$

$$f(x) = 2(x - 0)^2 + 0$$

$$f(x) = 3(x - 0)^2 + 0$$

$$f(x) = \frac{1}{2}(x - 0)^2 + 0$$

$$f(x) = \frac{1}{3}(x - 0)^2 + 0$$

$$f(x) = 1(x - 5)^2 + 0$$

$$f(x) = 1(x - 10)^2 + 0$$

$$f(x) = 1(x + 5)^2 + 0$$

$$f(x) = 1(x + 10)^2 + 0$$

$$f(x) = 1(x - 0)^2 + 5$$

$$f(x) = 1(x - 0)^2 + 10$$

$$f(x) = 1(x - 0)^2 - 5$$

$$f(x) = 1(x - 0)^2 - 10$$

3. Plot these 3 satellite dish designs with a computer. Annotate the focus (focal point) at  $(h, k + \frac{1}{4a})$  on the computer. Freehand below.

$$f(x) = \frac{1}{3}(x - 0)^2 + 2 \{y < 3\}$$

$$f(x) = \frac{1}{5}(x - 5)^2 + 1 \{y < 2\}$$

$$f(x) = \frac{1}{20}(x + 10)^2 + 0 \{y < 1\}$$