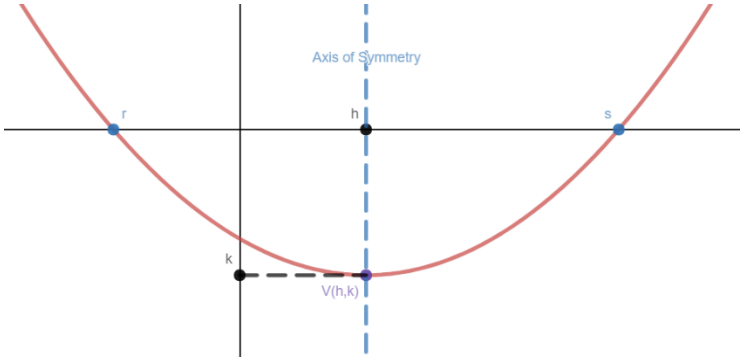
4.5 Quadratic Relations of the Form $y = a(x - r)(x - s)$

A The Factored Form

The *factored form* of a quadratic relation is

$$y = a(x - r)(x - s)$$

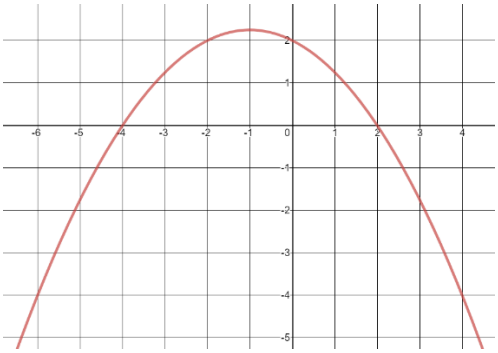


Desmos

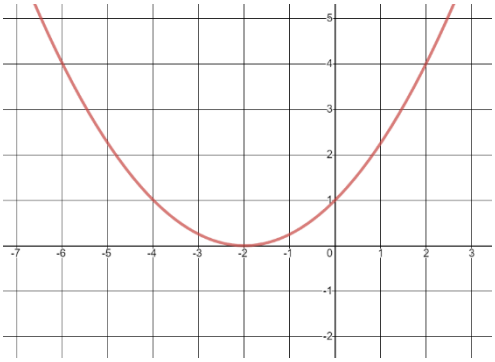
- ✓ *x-intercepts* are r and s
- ✓ *y-intercept* can be calculated by $y_{int} = a(0 - r)(0 - s)$ (substitute $x = 0$)
- ✓ To find the *vertex point* $V(h, k)$, first find $h = (r + s)/2$ and then replace x by h to get k
- ✓ Parabola *opens upward* if $a > 0$ and *downward* if $a < 0$

Example 1. For each case, find the equation of the quadratic relation graphed on the right grid.

a)



b)

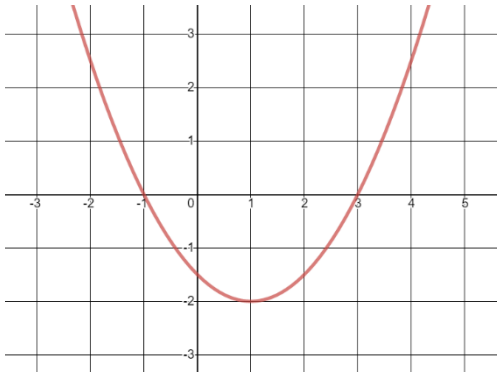


Example 2. Find the y-intercept of a quadratic relation that has the x-intercepts -2 and 4 and passes through the point $P(2,4)$.

Example 3. Describe and graph each of the following quadratic relations.

$y = a(x-r)(x-s)$	a) $y = x(x-4)$	b) $y = -2(x-1)(x+5)$	c) $y = 0.5(x+2)(x+4)$
x-intercepts are r and s			
y-intercept is $y_{int} = a(0-r)(0-s)$			
Axis of symmetry is $x = (r+s)/2$			
Vertex is $V(h,k)$ where: $h = (r+s)/2$ $k = a(h-r)(h-s)$			
$\|a\| > 1$ (vertical stretch) $\|a\| < 1$ (vertical compression)			
$a > 0$ (parabola opens upward) $a < 0$ (parabola opens downward)			
Range of y values			
Graph Sketch			

Example 4. Consider the quadratic relation given graphically below. In order to find its equation, would you use the factored form or the vertex form? Explain.



Example 5. (Application) A theatre company has 300 season ticket subscribers. The board of directors has decided to raise the price of a season ticket from the current value of $400. A survey of the subscribers has determined that, for every $20 increase in price, 10 subscribers would not renew their season tickets. What price would maximize the revenue and what is the maximum value of the revenue?

Notes: Textbook Pages 189-191
Homework: Textbook Pages 192-193 #3, ab, 5, 8, 13