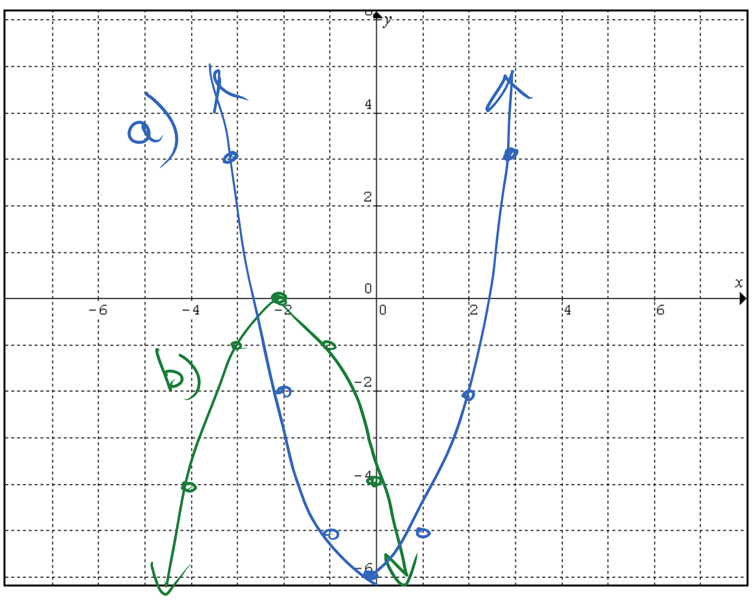
vertical stretch/compress. horizontal shift left or right

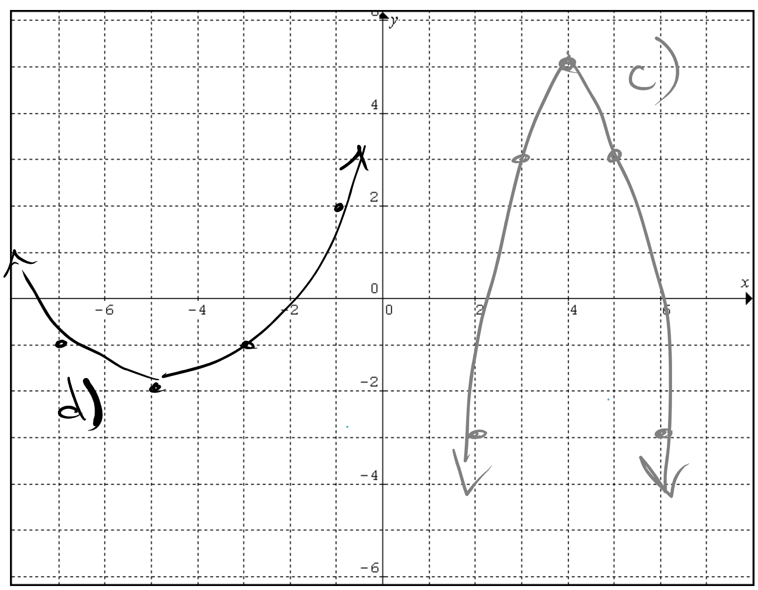
3.1 Quadratic Functions in Vertex Form – Part 3 $y = a(x - p)^2 + q$

vertical shift up or down

1. Graph the following quadratic functions:

$y = x^2 - 6$ $p =$ 0 $q =$ -6 $a =$ 1		b) $f(x) = -(x+2)^2$ $p =$ -2 $q =$ 0 $a =$ -1	
Coordinates of the vertex	(0,-6)	Coordinates of the vertex	(-2,0)
Axis of symmetry	x=0	Axis of symmetry	x=-2
Opening	up	Opening	down
Range	y ≥ -6	Range	y ≤ 0
Domain	x∈R	Domain	x∈R
Min/Max value	y=-6	Min/Max value	y=0

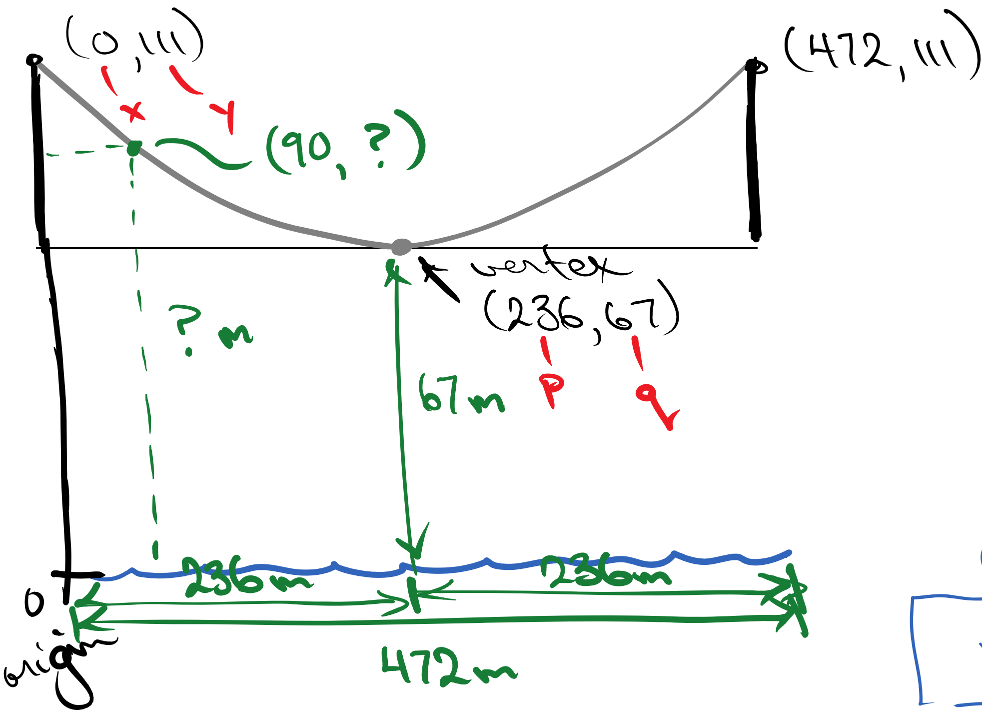




c) $y = -2(x-4)^2 + 5$ $p =$ 4 $q =$ 5 $a =$ -2		d) $f(x) = \frac{1}{4}(x+5)^2 - 2$ $p =$ -5 $q =$ -2 $a =$ 1/4	
Coordinates of the vertex	(+4,5)	Coordinates of the vertex	(-5,-2)
Axis of symmetry	x=4	Axis of symmetry	x=-5
Opening	down	Opening	up
Range	y ≤ 5	Range	y ≥ -2
Domain	x∈R	Domain	x∈R
Min/Max value	y=5	Min/Max value	y=-2

The deck of the Lions' Gate Bridge in Vancouver is suspended from two main cables attached to the tops of two supporting towers. Between the towers, the main cables take the shape of a parabola as they support the weight of the deck.
The towers are 111 m tall relative to the water's surface and are 472 m apart. The lowest point of the cables is approximately 67 m above the water's surface.

a) Model the shape of the cables with a quadratic function in vertex form (write the equation).



① use p, q, x, y to find a

$y = a(x-p)^2 + q$

$111 = a(0-236)^2 + 67$

$-67 \qquad -67$

$\dfrac{44}{55696} = \dfrac{55696a}{55696}$

$0.0008 = a$

② sub a, p, q in

$\boxed{y = .0008(x-236)^2 + 67}$

b) Determine the height above the surface of the water of a point on the cables that is 90 m horizontally from one of the towers (to the nearest tenth).

$x = 90$, find y → using equation sub x value in & solve for y

$y = .0008(x-236)^2 + 67$

90

$y = .0008(90-236)^2 + 67$

$= 17.05 + 67$

$= 84.05$

$\boxed{y = 84.1\text{ m}}$

Practice: page 159 #13, 14, 16, 17, 21