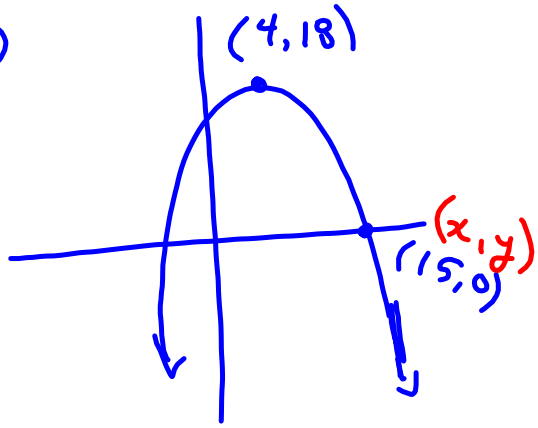
Ex. Find equation in Vertex form:

① 

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

$y = a(x-x)^2 + 18$

$0 = a(15-4)^2 + 18$

$\frac{-18}{121} = \frac{121a}{121}$

$\frac{-18}{121} = a$

$y = \frac{-18}{121}(x-4)^2 + 18$

② Through $(-1,7)$ with vertex $(-2,-1)$

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

$7 = a(-1+2)^2 - 1$

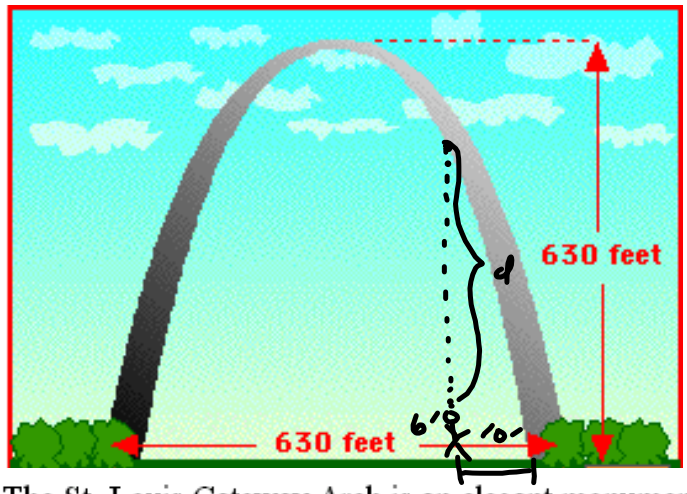
$8 = 1a$

$a = 8$

$y = 8(x+2)^2 - 1$

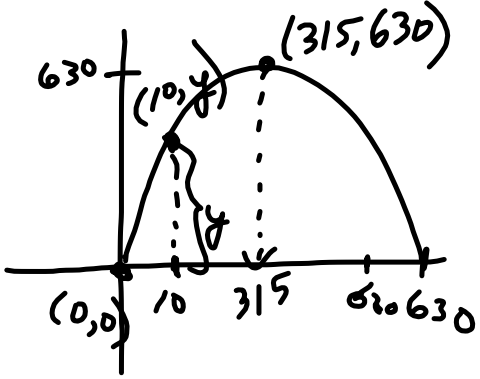
Warm-Up

St. Louis Gateway Arch - Equation that models???



The St. Louis Gateway Arch is an elegant monument to westward expansion in the USA. Located on the banks of the Mississippi River in St. Louis, Missouri, the 630-foot tall stainless steel arch rises above the city skyline. The Jefferson National Expansion Memorial consists of the Gateway Arch, the Museum of Westward Expansion, and St. Louis' Old Courthouse.

Answer: 33.37 feet



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

$0 = a(0-315)^2 + 630$

$\frac{-630}{(-315)^2} = \frac{a(-315)^2}{(-315)^2}$

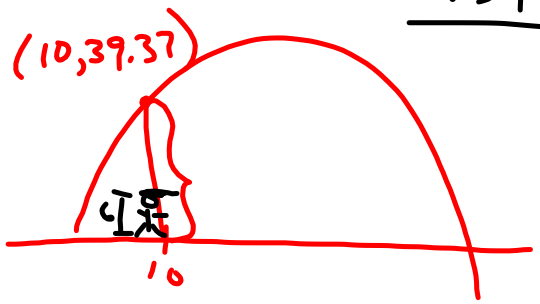
$a = \frac{-630}{(315)^2}$

$a = \frac{-2}{315}$

$y = \frac{-630}{(315)^2}(x-315)^2 + 630$

$y = \frac{-630}{(315)^2}(10-315)^2 + 630$

$y = 39.37 - 6' = 33.37 \text{ feet}$



Practice Problems...

$y = a(x-4)^2 + 7$
$V(4,7)$

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#7, 8, 9, 13, 14, 15, 16, 17, 18, ~~19~~, 20, 21

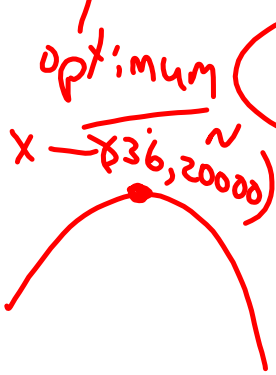
$f(x) = x+3$
$y = x+3$

optimum

$x = 36$, $N \approx$ (36, 20000)

$N(x) =$

$N =$



Standard --> Vertex Form

NOTES - Standard to Vertex Form.pdf

STANDARD

$$y = ax^2 + bx + c$$

- 'a' value
  - stretch factor
  - direction of opening
- y-intercept

VERTEX

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

- 'a' value
  - stretch factor
  - direction of opening
- vertex
  - A.O.S
  - Domain/Range
  - Max/Min y value
  - Sketch/Graph

$y = -3x^2 + 2x - 5$

We need to FACTOR...'Complete the Square' Method!!!

Perfect Square Trinomial

P.S. (x) P.S. (5)

$x^2 + 10x + 25$

$(x+5)^2$

PS ✓ ✓

$x^2 + 12x + 16$

x 4

$8x$

S --> V by **completing the square**

STEPS:

1) Factor out the 'a' value from both the x and x^2 terms [GCF].

2) **Complete the square** on the x term...
   - take half and square it!
   - add this constant within bracket
   - subtract constant outside bracket multiplied by the 'a' value in front.

3) **FACTOR** the perfect square trinomial

Note: √First & √Last with sign from middle

VERTEX FORM!!!

EXAMPLE #1...

$y = 1x^2 - 6x + 4$ ($\frac{1}{2}$ of 6)^2

$y = (x^2 - 6x + 9) + 4 - 9$

$y = (x-3)^2 - 5$

More Examples: S->V : Complete the square with "a=1"

#2. $y = x^2 + 14x$

$(\frac{1}{2}\text{ of } 14)^2$

$y = (x^2 + 14x + 49) - 49$

$y = (x+7)^2 - 49$

$V(-7, -49)$

#3. $y = x^2 - 8x - 15$

$y = (x^2 - 8x + 16) - 15 - 16$

$y = (x-4)^2 - 31$

$V(4, -31)$

#4. $y = x^2 + 9x + 2$

$\frac{1}{2}\text{ of } \frac{9}{1} = \left(\frac{9}{2}\right)^2$

$y = \left(x^2 + 9x + \frac{81}{4}\right) + \frac{8}{4} - \frac{81}{4}$

$y = \left(x + \frac{9}{2}\right)^2 - \frac{73}{4}$

$V\left(-\frac{9}{2}, -\frac{73}{4}\right)$

5) $y = x^2 - 5x - 10$ $\left(\frac{1}{2} \text{ of } 5\right)$

$y = \left(x^2 - 5x + \frac{25}{4}\right) - \frac{10}{1} - \frac{25}{4}$ $= \left(\frac{5}{2}\right)^2$

$y = \left(x - \frac{5}{2}\right)^2 - \frac{65}{4}$

$V\left(\frac{5}{2}, -\frac{65}{4}\right)$

6) $y = x^2 - \frac{3}{5}x + 2$ $\left(\frac{1}{2} \times \frac{3}{5}\right) = \left(\frac{3}{10}\right)^2$

$y = \left(x^2 - \frac{3}{5}x + \frac{9}{100}\right) + \frac{2}{1} - \frac{9}{100}$

$y = \left(x - \frac{3}{10}\right)^2 + \frac{191}{100}$

Attachments

NOTES - Standard to Vertex Form.pdf