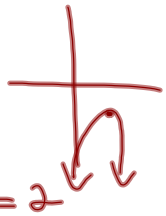
Warm Up



Given the quadratic described by the mapping $(x, y) \Rightarrow (x + 2, -2y - 2)$ ...

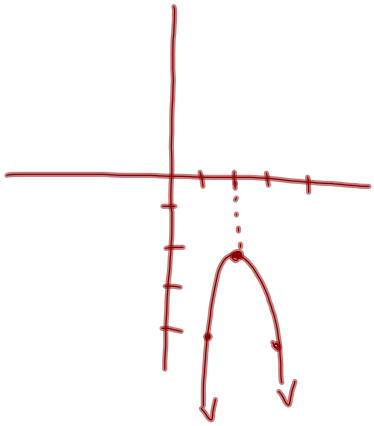
- State the coordinates of the vertex → $(2,-2)$
- State the equation of the axis of symmetry → $x = 2$
- State the domain and range D: $x \in \mathbb{R}$ R: $\{y / y \leq -2, y < \mathbb{R}\}$
- Express the equation in standard, transformational, and general form
- Sketch this quadratic

Standard: $y = -2(x-2)^2 - 2$

Transformational: $-\frac{1}{2}(y+2) = (x-2)^2$

General: $y = -2(x^2 - 4x + 4) - 2$

$y = -2x^2 + 8x - 10$



Determine the vertex of the following quadratic: $f(x) = -\frac{2}{5}x^2 + \frac{4}{25}x - 1$

$\frac{1}{2} \times \frac{2}{5} = \frac{1}{5}$, $\left(\frac{1}{5}\right)^2 = \frac{1}{25}$

$y = -\frac{2}{5}\left(x^2 - \frac{2}{5} + \frac{1}{25}\right) + \frac{2}{125} - 1$

$\frac{2}{25} \times -\frac{1}{5} = -\frac{2}{125}$

$y = -\frac{2}{5}\left(x - \frac{1}{5}\right)^2 - \frac{123}{125}$

$V\left(\frac{1}{5}, -\frac{123}{125}\right)$

Vertex?: $y = -4x^2 - 32x + 7$

$y = -4(x^2 + 8x + 16) + 7 + 64$ (−64)

$y = -4(x+4)^2 + 71$

$(-4, 71)$

Homework:

#6/ $y = \frac{1}{2}x^2 + 3x + 2$

$y = \frac{1}{2}(x^2 + 6x + 9) + 2 - \frac{9}{2}$ (9/2)

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

#7/ $y = -\frac{2}{3}x^2 - 8x + 1$

$y = -\frac{2}{3}(x^2 + 12x + 36) + 1 + 24$ (−24)

$y = -\frac{2}{3}(x+6)^2 + 25$

Determining Quadratic Functions From Parabolas

- **In order to determine the equation of a quadratic, you need to know...**

  (1) the vertex and another point on the parabola

  or

  (2) any three points on the parabola

S.F. $= \frac{12}{4} = 3$

ex: Determine the equation of the parabola having its vertex at (3, -5) and passing through the point (5, -17) $y = -3(x-3)^2 - 5$

- **STEPS:**

(1) Build the standard form of the equation using the known vertex.

(2) Let "a" represent the unknown stretch factor.

(3) Substitute the known point into the equation and solve for "a".

(4) Replace "a" value in the standard form equation.

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

$-17 = a(5-3)^2 - 5$

$-17 = 4a - 5$

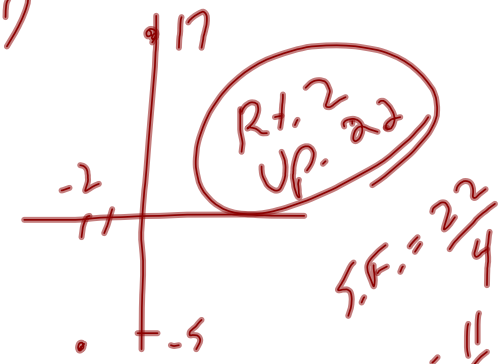
$-12 = 4a$

$-3 = a$

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

V(-2,-5) Thru: (0,17)

$y = \frac{11}{2}(x+2)^2 - 5$

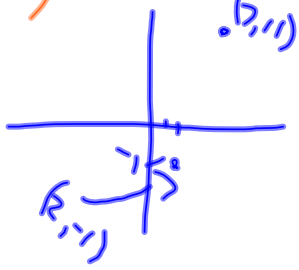


S.F. $= \frac{22}{4} = \frac{11}{2}$

$y = x^2$ Rt. 2 Up 4

Vertex: (7,11) Through (2,-1)

$y = -\frac{12}{25}(x-7)^2 + 11$



$y = a(x-7)^2 + 11$

$-1 = a(2-7)^2 + 11$

$-1 = 25a + 11$

$-12 = 25a$

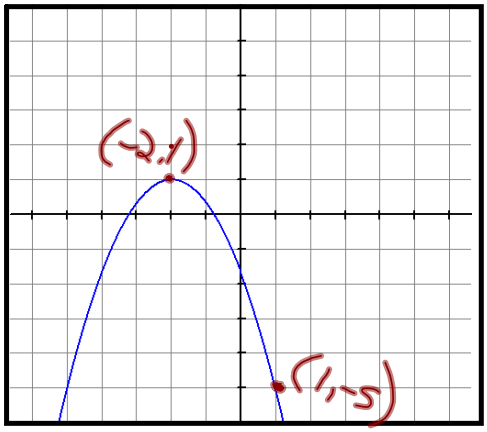
$\frac{-12}{25} = a$

Calculate Stretch factor

S.F. $= \frac{12}{25}$

EXAMPLES: Determine the equation for each...

#1.



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

$-5 = a(1+2)^2 + 1$

$-5 = 9a + 1$

$-6 = 9a$

$a = \frac{-6}{9} = -\frac{2}{3}$

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

#2.

X	Y1
-6	61
-5	33
-4	13
-3	1
-2	-3
-1	1
0	13

X=0

vertex

$y = 4(x+2)^2 - 3$

#3. vertex: (0, -3)
point: (-4, 37)

$y = \frac{5}{2}(x)^2 - 3$

Example 4:

Bonus

Determine the equation of the parabola that passes through the ordered pairs (-1,6), (0,1) and (2,3).

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

$y = ax^2 + bx + c$

Attachments

Worksheet - DeMoivres Theorem.doc