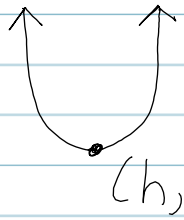
Sept. 17, 2012 3.6. Parabolas



$y = x^2$

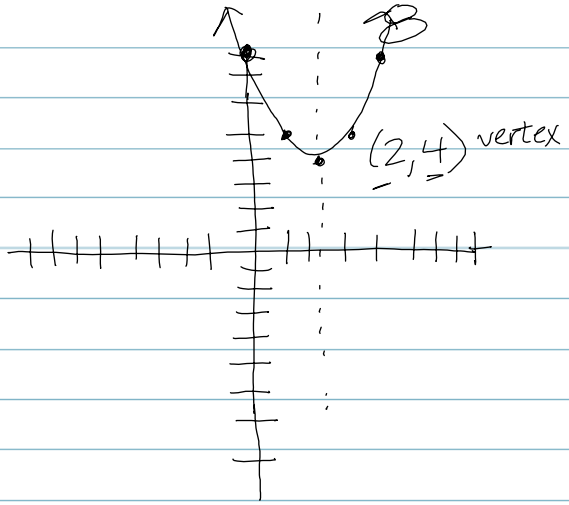
ex) $y = (x-2)^2 + 4$

$(0-2)^2 + 4$

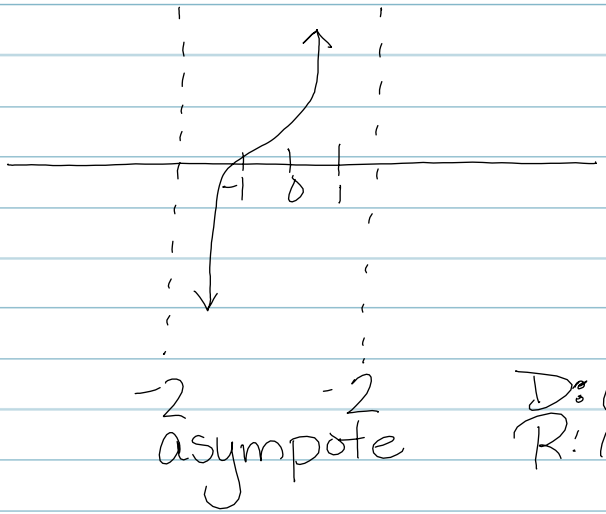
$(-2)^2 + 4$

$4 + 4$

x	y
-1	13
0	8
1	5
2	4
3	5
4	8



D: $(-\infty, \infty)$
R: $[4, \infty)$



D: $(-2, 2)$
R: $(-\infty, \infty)$

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

Standard form

$y = a(x-h)^2 + K$ "readable"

Vertex: (h, k)

General form "not readable"

$y = ax^2 + bx + c$

$h = -\frac{b}{2a}$ K = plug in h

x	y
h	k

a → 2 parts: sign & size

Sign

$a > 0$ (+) up

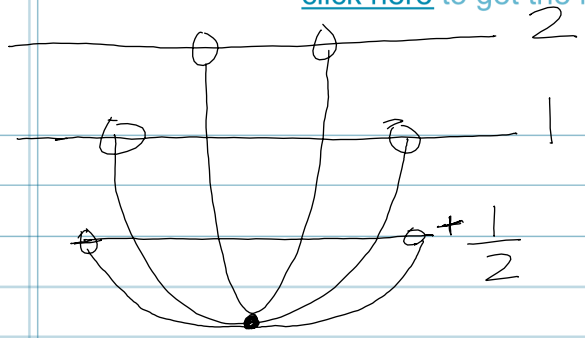
$a < 0$ (-) down

Size

$0 < |a| < 1$ compressed (wide)

$|a| = 1$ neutral

$|a| > 1$ stretched (narrow)



x-intercepts

$$x = h \pm \sqrt{\frac{-k}{a}}$$

examples: $y = -2(x-1)^2 + 3$

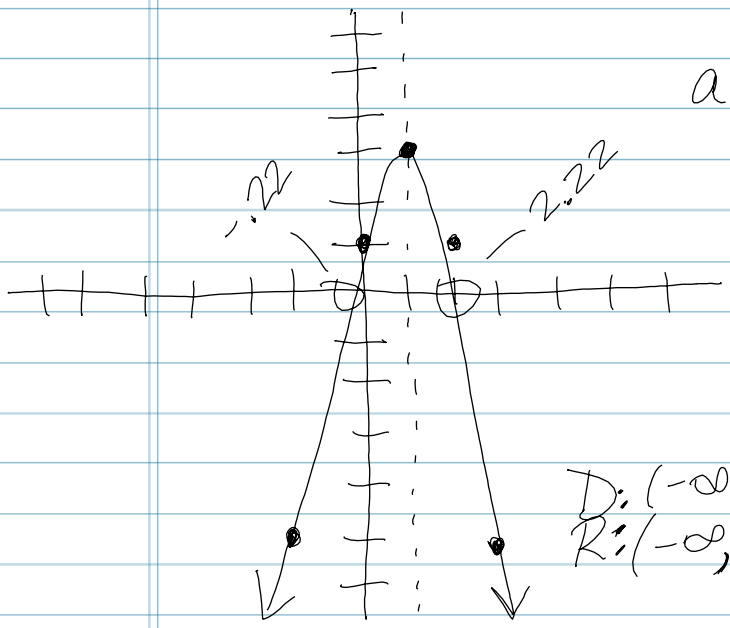
basic shape: $y = x^2$ ∪ - u shape parabola

Vertex: readable

$(h, k) = (1, 3)$

$a = -2$ — down

2 — stretched (narrow)



D: $(-\infty, \infty)$

R: $(-\infty, 3]$

x	y
-1	-5
0	1
1	3
2	1
3	-5

x-int

$x = h \pm \sqrt{\frac{-k}{a}}$

$(h, k) = (1, 3)$

$a = -2$

$x = 1 \pm \sqrt{\frac{-3}{-2}}$

$x = 1 \pm \sqrt{1.5}$

$x = 1 \pm 1.22$

$1 + 1.22 = 2.22$

$1 - 1.22 = -0.22$

examples:

$y = -2x^2 + 4x - 1$

basic shape: $y = x^2$

$a = -2$
$b = 4$
$c = -1$

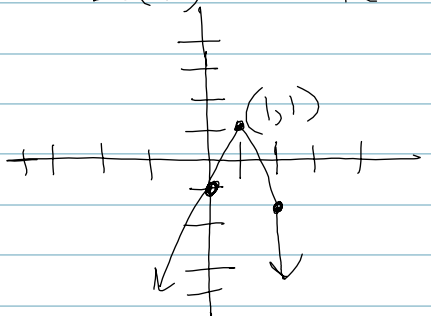
Vertex: not readable (general form)

$h = \frac{-b}{2a} = \frac{-4}{2(-2)} = \frac{-4}{-4} = 1$

x	y
-1	-7
0	-1
1	1
2	-1
3	-7

vertex (1, 1)

$k = -2(1)^2 + 4(1) - 1 = 1$



D: $(-\infty, \infty)$
R: $(-\infty, 1]$

$y = -2(3)^2 + 4(3) - 1$
$= -2(9) + 12 - 1$
$= -18 + 1 + 12$
$= -7$

X-intercepts

$x = h \pm \sqrt{-k/a}$

$(h, k) = (1, 1)$

$a = -2$

$x = 1 \pm \sqrt{\frac{-1}{-2}}$

$x = 1 \pm \sqrt{0.5}$

$1 - 0.707 = .293$
$1 + 0.707 = 1.707$