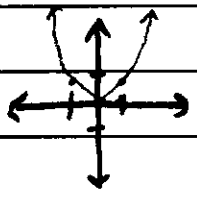
# Algebra 3.6 Quadratics

$ax^2+bx+c$ vertex — minimum; vertex — maximum; $(\frac{-b}{2a}, f(\frac{-b}{2a}))$

axis of symmetry $x=\frac{-b}{2a}$

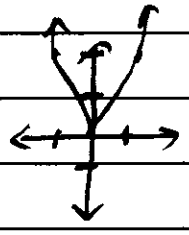
Ex graph $f(x)=\frac{1}{2}x^2$

| x | y |
|---|---|
| -1 | 1/2 |
| 0 | 0 |
| 1 | 1/2 |



$g(x)=2x^2$

| x | y |
|---|---|
| -1 | 2 |
| 0 | 0 |
| 1 | 2 |



Ex Find the vertex & x intercepts for the following:

a) $f(x)=x^2+5$

$(\frac{0}{2a}, f(0)) = (0,5)$

no x intercepts

$0=x^2+5$

$x^2=-5$

$x=\pm\sqrt{-5}$

X no

b) $g(x)=-x^2+4x$

vertex $(\frac{-4}{2(-1)}, f(2)) = (2,4)$

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

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

$=-4+8$

$=4$

x intercepts

$0=-x^2+4x$

$0=-x(x-4)$

$x=0,4$

Standard Equation $y=a(x-h)^2+k$ vertex $(h,k)$

Ex Write $y=x^2+4x+9$ into standard equation

$y=x^2+4x+4+9-4$

$y=(x+2)^2+5$

vertex: $(-2,5)$

Write $y=-3x^2-6x-5$ into standard equation

$y=-3(x^2+2x+1)-5+3$

$-3$

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

vertex: $(-1,-2)$ down shaped parabola, skinny

# Algebra 3.6

Write $y = 2x^2 - 10x + 7$ into the standard equation

$y = 2(x^2 - 5x + \frac{25}{4}) + 7 - \frac{25}{2}$

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

vertex $(\frac{5}{2}, -\frac{11}{2})$ up shaped, skinny

Write $y = -\frac{3}{4}x^2 + 15x - 16$ into the standard equation

$-\frac{3}{4} \cdot ? = 15$

$? = 15(-\frac{4}{3}) = -20$

$y = -\frac{3}{4}(x^2 - 20x + 100) - 16 + 75$

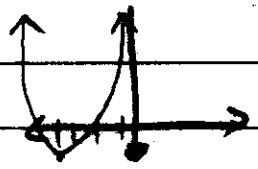
$y = -\frac{3}{4}(x - 10)^2 + 59$

vertex $(10, 59)$ open down, fat

Ex Find the standard equation for any parabola w/vertex $(-6, 3)$

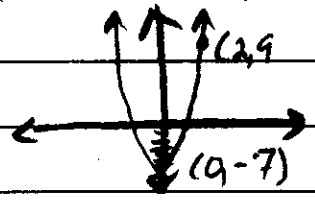
$y = a(x+6)^2 + 3$

Ex Find the standard equation of the graph below: (assume $a = 1$)



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

Ex As above, except don't assume $a = 1$




$y = a(x+0)^2 - 7$

$y = ax^2 - 7 \Rightarrow y = 4x^2 - 7$

$9 = a(2)^2 - 7$

$9 = 4a - 7$

$16 = 4a$

$a = 4$

# Algebra 3.6

Find the minimum value & the zeros of the function

$y = x^2 + 6x + 8$

$y = x^2 + 6x + 9 + 8 - 9$

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

vertex $(-3, -1)$ (Min value)

$0 = x^2 + 6x + 8$

$0 = (x+4)(x+2)$

$x = -4, -2$ zeros are $-4, -2$

Ex An object is projected vertically upward with an initial velocity of 176 ft/sec. It's distance in feet above ground after $t$ seconds is given by the equation $s(t) = -16t^2 + 176t + 96$

Find the maximum height of the object

$s(t) = -16(t^2 - 11t + \frac{121}{4}) + 96 + 484$

$s(t) = -16(t - \frac{11}{2})^2 + 580$

vertex $(\frac{11}{2}, 580)$ (maximum value

max height is 580 feet