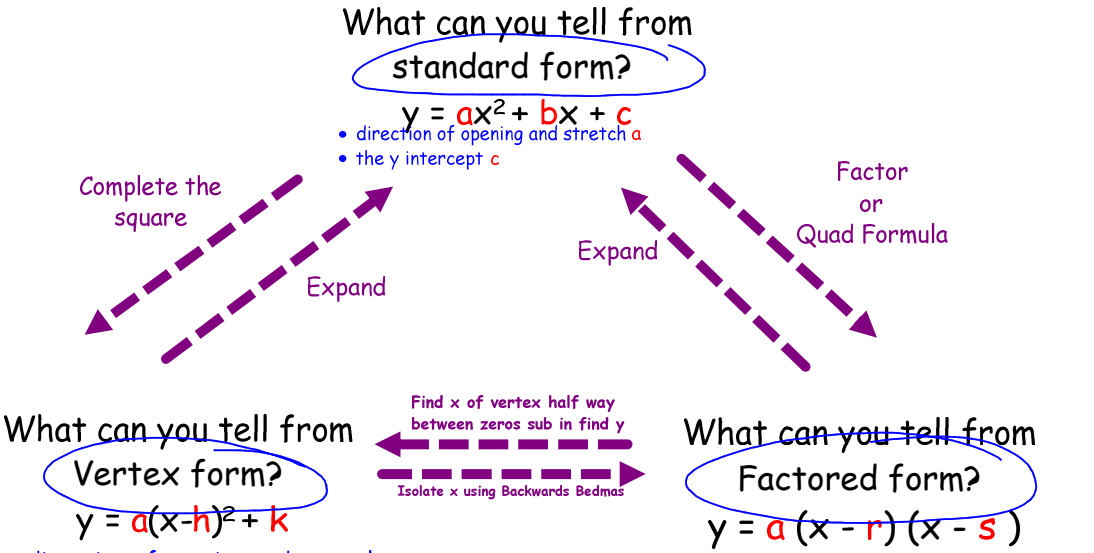
2.4A Zeros

Mind Map:

Quadratics can be represented in a number of different forms

Recall: What we know when given equations in various forms



- direction of opening and stretch a
- the vertex (h,k)
- max/min & when it occurs

Can find:

- the zeros (set = to 0 and solve for x using backward BEDMAS)
- y-intercept (sub in x = 0)

- direction of opening and *stretch a
- the zeros r and s

Can find:

- vertex (half way between the zeros)
- y-intercept (sub in x=0)

*be careful of the stretch:

y = 2(x+1)(x-5) stretch factor 2

y = 2(3x+1)(4x-5)

stretch factor 2(3)(4) = 24

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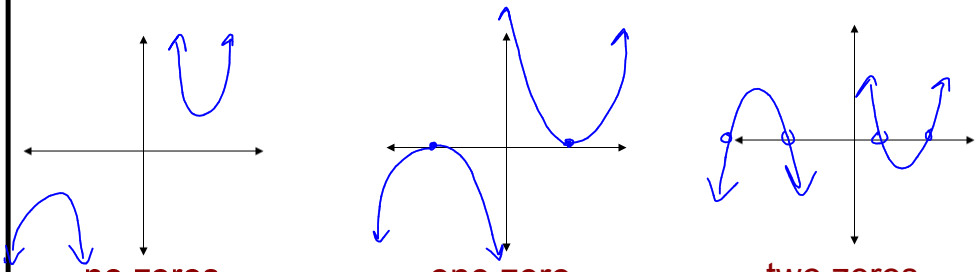
Recall:

Quadratics can have no zeros, 1 zero, or 2 zeros.

Sketch examples of each scenario:



no zeros one zero two zeros

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A. Factored Form and Zeros

Ex 1: ~~Solve~~ Find Zeroes

a) $y=(x-3)(x+4)$

Already factored

$0=(x-3)(x+4)$

$x-3=0$ or $x+4=0$

$x=3$ $x=-4$

b) $y=x^2+7x-30$

$y=(x+10)(x-3)$ solved

$0=(x+10)(x-3)$

$x=-10$ or $x=3$

How do you find zeros?
1. Set equal to 0.
2. Factor
3. Set each factor = 0 and solve for x

c) $y=4x^2-9$

Method 1

$0=(2x-3)(2x+3)$

$x=\frac{3}{2}$ $x=-\frac{3}{2}$

$x=\pm\frac{3}{2}$

Method 2

$0=4x^2-9$

$9=4x^2$

$\frac{9}{4}=x^2$

$\pm\sqrt{\frac{9}{4}}=x$

$x=\pm\frac{3}{2}$

d) $y=3x^2+12x$

$0=3x^2+12x$

$=3x(x+4)$

$x=0$ or -4

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Can find:
- vertex (half way between the zeros)

Ex 2: Find the vertex by solving first

a) $y = 3x^2 + 12x$

$0 = 3x(x+4)$

$x = 0$ or -4

Midpoint

$x_m = \frac{0+(-4)}{2}$

$= -2$

Vertex

Sub in x_m

$y = 3(-2)^2 + 12(-2)$

$= -12$

∴ Vertex is $(-2, -12)$

b) $y=6x^2+5x-4$

$y = (3x+4)(2x-1)$

Set $y=0$ & solve

$x = -\frac{4}{3}$ or $x = \frac{1}{2}$

Midpoint

$x_m = \frac{-\frac{4}{3} + \frac{1}{2}}{2}$

$= \frac{-\frac{5}{6}}{2}$

$= -\frac{5}{6} \times \frac{1}{2}$

$= \frac{-5}{12}$

M -24
A 5

N 6/8 6/-3
3/4 2/-1
24
1,24
2,12
3,8
4,6

Vertex

Sub in x_m

$y = \left(2\left(-\frac{5}{12}\right)-1\right)\left(3\left(-\frac{5}{12}\right)+4\right)$

$= \left(-\frac{5}{6}-1\right)\left(-\frac{5}{4}+4\right)$

$= \left(-\frac{11}{6}\right)\left(\frac{11}{4}\right)$

$= \left(\frac{-121}{24}\right)$

∴ Vertex $\left(-\frac{5}{12}, \frac{-121}{24}\right)$

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B. Vertex Form and Zeros

Ex. 3 Find the zeros for each of the following:

How do you find zeros?
1. Set equal to 0.
2. Isolate x using SAMDEB and opposite operations

a) $y = 2(x-3)^2 - 8$

$0 = 2(x-3)^2 - 8$

$8 = 2(x-3)^2$

$4 = (x-3)^2$

$\pm 2 = x - 3$

$\pm 2 + 3 = x$

$x = 1$ OR $x = 5$

b) $y = 7(x+5)^2 + 21$

Set $= 0$ & solve

$7(x+5)^2 + 21 = 0$

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

$x + 5 = \pm\sqrt{-3}$ NO REAL ROOTS

C. Zeros and the Quadratic Formula

Exact answers only!!!

Recall: The quadratic formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Ex 4: Solve. Give exact answers only.

a) $3x^2 + 4x - 2 = 0$

$a = 3 \quad b = -4 \quad c = -2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-4 \pm \sqrt{4^2 - 4(3)(-2)}}{2(3)}$$

$$= \frac{-4 \pm \sqrt{16 + 24}}{6}$$

$$= \frac{-4 \pm \sqrt{40}}{6}$$

$$= \frac{-4 \pm 2\sqrt{10}}{6}$$

$$x = \frac{-2 \pm \sqrt{10}}{3}$$

b) $6x^2 - 7x + 2 = 0$

$a = 6 \quad b = -7 \quad c = 2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{7 \pm \sqrt{(-7)^2 - 4(6)(2)}}{2(6)}$$

$$= \frac{7 \pm \sqrt{49 - 48}}{12}$$

$$= \frac{7 \pm 1}{12}$$

$x = \dfrac{7+1}{12}$ or $x = \dfrac{7-1}{12}$

$= \dfrac{2}{3}$ $= \dfrac{1}{2}$

HMWK:
p.128 #2dg, 3e, 4a, 5cg, 7a, 8df, 9d,
10hl, 11aceg, 12i, 13h, 14ag
Handout "HWK 2.4A" extra (posted)

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