Key

Solving Quadratic Equations

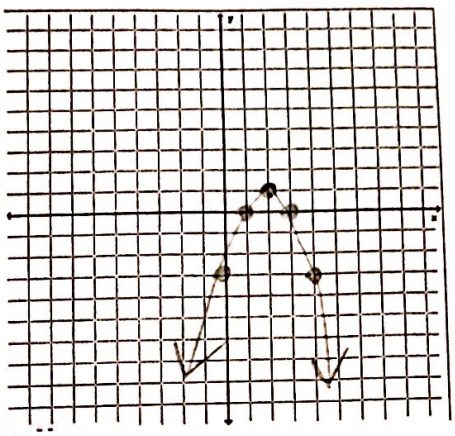
Find the zeros of each function by graphing and using a table.

1) $f(x) = -x^2 + 4x - 3$

Axis of Symmetry: $\frac{-4}{2(-1)} = 2$

Vertex: (2, 1)

x	0	1	2	3	4
y	-3	0	1	0	-3



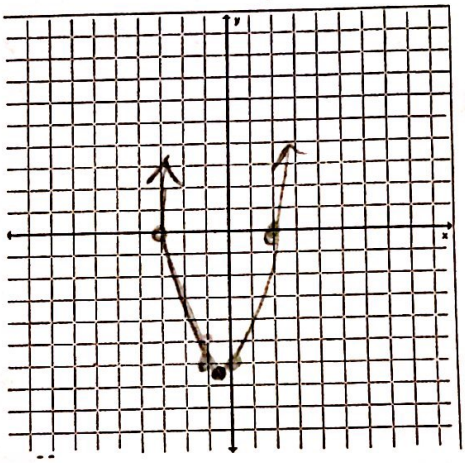
Zeros = (1,0) (3,0)

2) $g(x) = x^2 + x - 6$

Axis of Symmetry: $x = -\frac{1}{2}$

Vertex: $(-\frac{1}{2}, -6.25)$

x	-3	-1	-½	0	2
y	0	-6	-6.25	-6	0



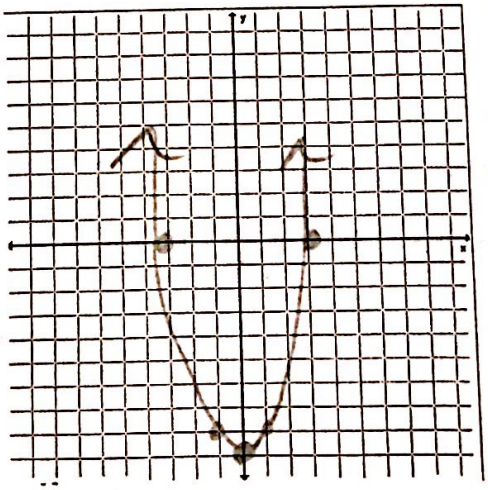
Zeros: (-3,0) (2,0)

3) $f(x) = x^2 - 9$

Axis of Symmetry: $x = 0$

Vertex: (0, -9)

x	-3	-1	0	1	3
y	0	-8	-9	-8	0



Zeros: (-3, 0) (3, 0)

Find the zeros of the functions using a graphing calculator.

4) $f(x) = x^2 + 2x - 8$

(-4, 0) (2, 0)

5) $g(x) = x^2 - 16$

(-4, 0) (4, 0)

6) $h(x) = x^2 - x - 12$

(-3, 0) (4, 0)

7) $f(x) = -2x^2 + 4x$

(0, 0) (2, 0)

8) $g(x) = x^2 - 5x - 6$

(-1, 0) (6, 0)

9) $h(x) = 3x^2 + x - 4$

(-1⅓, 0) (1, 0)

10) A baseball player hits a ball toward the outfield. The height h of the ball in feet is modeled by $h(t) = -16t^2 + 22t + 3$, where t is the time in seconds. In addition, the function $d(t) = 85t$ models the horizontal distance traveled by the ball.

a) If no one catches the ball, how long will it stay in the air?

We can find when the ball will hit the ground again.
Using the calculator, $0 = -16t^2 + 22t + 3$ when $t = 0$ & $t = 1.5$
So, the ball stayed in the air for 1.5 seconds.

b) What is the total horizontal distance the ball travels before it hits the ground?

Horizontal distance is measured by $d(t) = 85t$.
So $d(1.5) = 85(1.5) = 127.5$
The ball travels 127.5 feet.

Find the roots of each equation by factoring.

11) $x^2 + 8x = -16$

$x^2 + 8x + 16 = 0$
$(x + 4)(x + 4) = 0$
$x = -4, -4$

12) $4x^2 = 81$

$4x^2 - 81 = 0$
$(2x + 9)(2x - 9) = 0$
$x = -9/2 \quad x = 9/2$

13) $9x^2 + 12x + 4 = 0$

$(9x^2 + 6x) + (6x + 4) = 0$
$3x(3x + 2) + 2(3x + 2) = 0$
$(3x + 2)(3x + 2) = 0$
$x = -2/3, -2/3$

14) $36x^2 - 9 = 0$

$(6x - 3)(6x + 3) = 0$
$x = \frac{1}{2}, -1/2$

15) $x^2 - 10x + 25 = 0$

$(x - 5)(x + 5) = 0$
$x = -5, x = 5$

16) $49x^2 = 28x - 4$

$49x^2 - 28x + 4 = 0$
$(49x^2 - 14x) - (14x + 4) = 0$
$7x(7x - 2) - 2(7x - 2) = 0$
$(7x - 2)(7x - 2) = 0$
$x = 2/7 \quad x = 2/7$

17) $25x^2 + 40x = -16$

$25x^2+40x+16=0$

$(25x^2+20x)+(20x+16)=0$

$5x(x+4)+4(x+4)=0$

$(5x+4)(x+4)=0$

$x=-\frac{4}{5}, \quad x=-4$

19) $5x^2 = -45$

$5x^2+45=0$

$5(x^2+9)=0$ → Does not factor

$\frac{5x^2}{5}=\frac{-45}{5}$

$x^2=-9$

$x=\pm 3i$

Using Square Roots

18) $9x^2 + 6x = -1$

$9x^2+6x+1=0$

$x=-\frac{1}{3}, -\frac{1}{3}$

$(9x^2+3x)+(3x+1)=0$

$3x(3x+1)+1(3x+1)=0$

$(3x+1)(3x+1)=0$

20) $x^2 - 6 = x$

x^2-x-6

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

$x=3, \quad x=-2$

Find the type and number of solutions for each equation. b^2-4ac

21) $2x^2 - 3x = 8$

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

$(-3)^2-4(2)(-8)=9+64=73$

2 real solutions

22) $2x^2 - 16x = -32$

$2x^2-16x+32=0$

$(-16)^2-4(2)(32)=256-256=0$

1 real solution

23) $4x^2 - 28x = -49$

$4x^2-28x+49=0$

$(-28)^2-4(4)(49)=784-784=0$

1 real solution

24) $3x^2 - 8x + 8 = 0$

$(-8)^2-4(3)(8)=64-96=-32$

2 imaginary solutions

Find the zeros of each function using the Quadratic Formula.

25) $f(x) = 2x^2 + 7x - 13$

$\frac{-(7)\pm\sqrt{(7)^2-4(2)(-13)}}{2(2)}=\frac{-7\pm\sqrt{153}}{4}=\frac{-7\pm 3\sqrt{17}}{4}$

$\frac{-7+3\sqrt{17}}{4}$

$\frac{-7-3\sqrt{17}}{4}$

26) $g(x) = x^2 - x - 5$

$\frac{(-1)\pm\sqrt{(-1)^2-4(1)(-5)}}{2(1)}=\frac{1\pm\sqrt{21}}{2}$

$\frac{1+\sqrt{21}}{2}$

$\frac{1-\sqrt{21}}{2}$

27) $h(x) = -3x^2 + 4x - 4$

$\frac{-(4)\pm\sqrt{(4)^2-4(-3)(-4)}}{2(-3)}=\frac{-4\pm\sqrt{-32}}{-6}=\frac{-4\pm 4i\sqrt{2}}{-6}=\frac{-2\pm 2i\sqrt{2}}{-3}$

$\frac{-2+2i\sqrt{2}}{-3}$

$\frac{-2-2i\sqrt{2}}{-3}$