

5.3 Solving from Standard Form by Factoring

Finding the zeros of $y = ax^2 + bx + c$ is the same as solving the equation $ax^2 + bx + c = 0$

To Solve a Quadratic Equation:

- write in the form $ax^2 + bx + c = 0$
- fully factor
- determine the value of x that makes each factor equal to zero

Ex. 1 Solve.

a) $x^2 - 5x = 0$
 $x(x-5) = 0$
 $x = 0, 5$

b) $2x^2 - 8x = 0$
 $2x(x-4) = 0$
 $x = 0 \ \& \ x = 4$

c) $x^2 + 4x - 5 = 0$
 $(x-1)(x+5) = 0$
 $x = 1, -5$

d) $x^2 - 7x + 12 = 0$
 $(x-3)(x-4) = 0$
 $x = 3, 4$

M 12
A -7
N -3, -4

e) $2x^2 + 5x - 3 = 0$
 $(2x-1)(x+3) = 0$

M -6
A 5
N -1, 6

$x = -3, \frac{1}{2}$

x	$2x^2$	$-x$
3	$6x$	-3

$2x - 1 = 0$
 $2x = 1$
 $x = \frac{1}{2}$

f) $10x^2 + 19x + 6 = 0$
 $(2x+3)(5x+2) = 0$

M 60
A 19
N 15, 4

$2x + 3 = 0$
 $2x = -3$
 $x = -\frac{3}{2}$

$5x + 2 = 0$
 $5x = -2$
 $x = -\frac{2}{5}$

$5x$	$2x$	3
2	$10x^2$	$15x$
	$4x$	6

$x = -\frac{3}{2}, -\frac{2}{5}$

Ex. 2 Solve.

a) $3y^2 + 15y + 18 = 0$
 $3(y^2 + 5y + 6) = 0$
 $3(y+3)(y+2) = 0$

$y = -3, -2$

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

$x = \pm 4$

c) $4b^2 - 9 = 0$
 $(2b-3)(2b+3) = 0$

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

d) $-m^2 + 7m - 10 = 0$
 $-(m^2 - 7m + 10) = 0$
 $-(m-5)(m-2) = 0$

$m = 2, 5$

e) $4x^2 + 14x = 8$
 $4x^2 + 14x - 8 = 0$
 $2(2x^2 + 7x - 4) = 0$
 $2(2x-1)(x+4) = 0$

M -8
 A 7
 N -1, 8

$x = -4, \frac{1}{2}$

	$2x$	-1
x	$2x^2$	$-x$
4	$8x$	-4

f) $w^2 + 4 = 3w(w-5)$
 $w^2 + 4 = 3w^2 - 15w$
 $0 = 2w^2 - 15w - 4$

M -8
 A -15

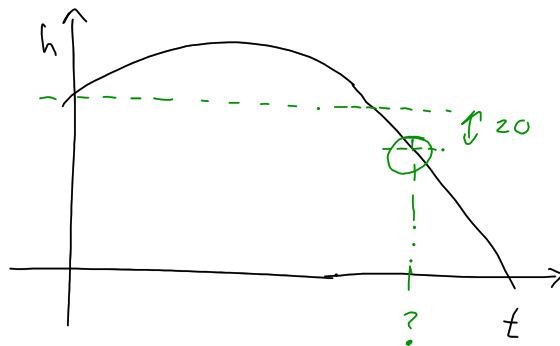
NOT FACTORABLE

Ex. 3 A ball is thrown from a cliff. Its height, h , in metres, above the sea, after t seconds, can be modelled by the equation $h = -5t^2 + 21t + 120$.
 How long will the ball take to fall 20 m below its initial height?

Initial Height?
 $t = 0 \quad h = 120$

Target Height?
 $h = 100$

- Set equation equal to target height
- Re-arrange = 0, then solve



$$100 = -5t^2 + 21t + 120$$

$$0 = -5t^2 + 21t + 20$$

$$= -(5t^2 - 21t - 20)$$

$$= -(t-5)(5t+4)$$

$$t = 5, -\frac{4}{5}$$

↑
 Garbage!
 Not a valid time
 (negative time)

M	-100	100
		1,100
A	-21	2,50
		4,25

N -25, 4

	t	-5
$5t$	$5t^2$	$-25t$
4	$4t$	-20

∴ Ball reaches 100m at $t = 5s$