MCR3U 1.5 Determining x-intercepts by factoring

We can determine the x-intercepts of a quadratic function when $f(x) = 0$ by factoring or quadratic formula

When factoring a quadratic equation it is important to:

- Remove common factors first
- Recognize a "difference of squares"

Ex. Factor to determine the x-intercepts then graph the following quadratic functions.

a) $f(x) = -x^2 + 4$ b) $g(x) = 2x^2 - 8x$ c) $h(x) = -3x^2 + 42x - 144$

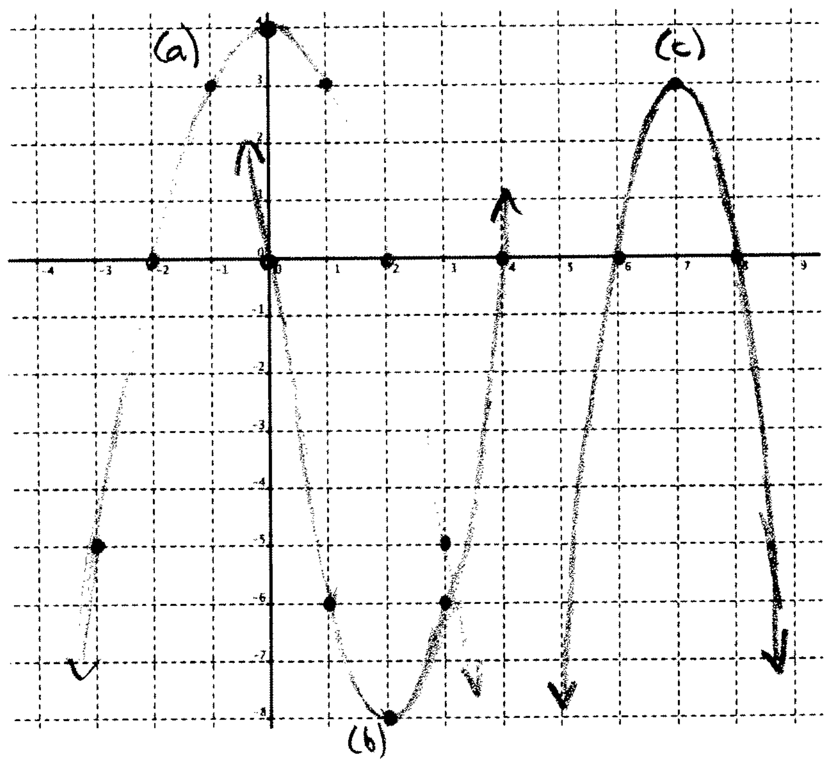
a) $f(x) = -(x^2 - 4)$
$= -(x-2)(x+2)$

x-ints: 2, −2

Vertex: $x = \frac{-b}{2a} = \frac{0}{-2} = 0$

$f(0) = -(0)^2 + 4 = 4$

$\therefore V(0,4)$



b) $g(x) = 2x^2 - 8x$
$= 2x(x-4)$

x-ints: 0, 4

Vertex: $x = \frac{-b}{2a} = \frac{8}{2(2)} = 2$

$g(2) = 2(2)^2 - 8(2) = -8$

$V(2,-8)$

c) $h(x) = -3x^2 + 42x - 144$
$= -3(x^2 - 14x + 48)$
$= -3(x-6)(x-8)$

x-ints: 6, 8

Vertex $x = \frac{-b}{2a} = \frac{-42}{2(-3)} = 7$

$h(7) = -3(7-6)(7-8) = 3$

<u>1.7 Solving linear-quadratic systems</u>

We can determine the points where a quadratic function intersects a linear function (when $f(x) = g(x)$) by factoring or quadratic formula.

Ex. Determine the point(s) of intersection of the line $y = -3$ with the parabola $y = x^2 + 6x + 2$. Draw a sketch to illustrate your solution.

$y = -3 = x^2+6x+2$

$-3 = x^2+6x+2$

$0 = x^2+6x+5$

$0 = (x+5)(x+1)$

$\therefore x = -5, -1$

$x=-5 \Rightarrow y=-3$

$x=-1 \Rightarrow y=-3$

$\therefore$ They intersect at $(-5,-3)$ and $(-1,-3)$

Ex. Determine the point(s) of intersection of the linear function $g(x) = -2x + 10$ with the quadratic function $f(x) = -x^2 + 10x - 22$. Draw a sketch to illustrate your solution.

They intersect where

$-2x+10 = -x^2+10x-22$

$0 = -x^2+10x-22+2x-10$

$0 = -x^2+12x-32$

$0 = -(x^2-12x+32)$

$0 = -(x-4)(x-8)$

$\therefore x = 4, 8$

$x=4 \Rightarrow y = -2(4)+10$
$= 2$

$x=8 \Rightarrow y = -2(8)+10$
$= -6$

$\therefore$ They intersect at $(4,2)$ and $(8,-6)$

Homework: p. 67 # 1.