# Quadratic-Like Equations

**Goal**: To solve equations that can be thought of as quadratic.

ex Solve

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

($y-3$ is $u$ in both places)

let $u = y-3$ (make sub)

$u^2 - 5u + 6 = 0$

$(u-2)(u-3) = 0$

$u-2 = 0$ or $u-3 = 0$

$u = 2$ or $u = 3$

back sub

$y-3 = 2$ $\quad$ $y-3 = 3$

$y = 5$ or $y = 6$

b) $x^4 + 3x^2 - 28 = 0$

($x^4$ is $u^2$, $x^2$ is $u$)

let $u = x^2$

let $u = x^2$

$u^2 = (x^2)^2 = x^4$

$u^2 + 3u - 28 = 0$

$(u+7)(u-4) = 0$

$u+7=0$ , $u-4=0$

$u = -7$ or $u = 4$ ← Back sub

$\sqrt{x^2} = \pm\sqrt{-7}$ $\quad \sqrt{x^2} = \pm\sqrt{4}$

$x = \pm\sqrt{-7}$

$x = \pm i\sqrt{7}$ $\quad x = \pm 2$ *

c) $2m + \sqrt{m} = 15$

$2m^{1} + m^{\frac{1}{2}} = 15$

$u = m^{\frac{1}{2}}$

$u^2 = (m^{\frac{1}{2}})^2 = m$

$2u^2 + u = 15$

$2u^2 + 1u - 15 = 0$

$(2u-5)(u+3) = 0$

$2u-5=0$ or $u+3=0$

$u = \frac{5}{2}$ or $u = -3$

$(m^{\frac{1}{2}})^2 = (\frac{5}{2})^2$ $\quad m^{\frac{1}{2}} = -3$

$m = \frac{25}{4}$ $\quad \sqrt{m} \neq -3$ ← wouldn't check (extraneous)

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$m \neq 9$

**ex** Find the x and y intercepts:

$$f(x) = x - 4\sqrt{x} - 1$$

y-int:

$f(0) = 0 - 4\sqrt{0} - 1 = -1$

$(0, -1)$ ← y-int.

x-int:

$0 = x - 4\sqrt{x} - 1$

$u = \sqrt{x}$

$u^2 = x$

$1u^2 - 4u - 1 = 0$

$u = \frac{4 \pm \sqrt{16 - 4(1)(-1)}}{2}$

$u = \frac{4 \pm \sqrt{20}}{2}$

$u = \frac{4 \pm 2\sqrt{5}}{2}$

$u = \frac{2(2 \pm \sqrt{5})}{2}$

$u = 2 - \sqrt{5}$ or $u = 2 + \sqrt{5}$

$\sqrt{x} = 2 - \sqrt{5}$ ($< 0$) or $(\sqrt{x})^2 = (2 + \sqrt{5})^2$

$x = 4 + 4\sqrt{5} + 5$

$x = 9 + 4\sqrt{5}$

x-int. → $(9 + 4\sqrt{5}, 0)$