a. Try a substitution to make this a quadratic equation.
   Target equation in terms of $u$ is usually patterned after the equation in $x$
b. Substitution to try: focus on the $u$ term in the target equation and look back to the corresponding part of the equation in $x$. Substitute for $u$ in the target equation and see if you get the original equation (in $x$)
c. Then solve for $x$ in terms of $u$
d. Solve the equation in $u$.
e. Derive solutions for $x$ from the solutions for $u$.
f. Check the solutions

Examples: p. 139
#50: $x^4 - 10x^2 + 25 = 0$

a. Target: $u^2 - 10u + 25 = 0$
b. Substitution: $u = x^2$. Then $u^2 - 10u + 25 = 0$ is the same as
   $(x^2)^2 - 10(x^2) + 25 = 0$ or
   $x^4 - 10x^2 + 25 = 0$. So the substitution works.
c. $u = x^2$ - solve for $x$. Sqrt of both sides: $x = \pm\sqrt{u}$
d. Solve $u^2 - 10u + 25 = 0$
   $(u-5)^2 = 0$
   $u - 5 = \pm\sqrt{0} = 0$
   REMEMBER: $\sqrt{0} = 0$ since $0 * 0 = 0$. Also remember: $-0 = 0$.
   So $u = 5$ is the single solution in $u$
e. If $u = 5$ then $x = \pm\sqrt{u} = \pm\sqrt{5}$ so the solutions for $x$ are

| $x = \sqrt{5}$ and $x = -\sqrt{5}$ |
|---|

f. Check: if $x = \sqrt{5}$ then
   $x^4 - 10x^2 + 25 = (\sqrt{5})^4 - 10\left(\sqrt{5}\right)^2 + 25$
   $= 5^{\left(\frac{1}{2}*4\right)} - 10 * 5^{\left(\frac{1}{2}*2\right)} + 25 = 5^2 - 10 * 5^1 + 25 = 25 - 50 + 25 = 0$ OK
   And if $x = -\sqrt{5}$ then
   $x^4 - 10x^2 + 25 = (-\sqrt{5})^4 - 10\left(-\sqrt{5}\right)^2 + 25$
   $= (-1)^4 * (\sqrt{5})^4 - 10 * (-1)^2 * \left(\sqrt{5}\right)^2 + 25$
   $= (\sqrt{5})^4 - 10\left(\sqrt{5}\right)^2 + 25$
   Just like above so this solution is OK too.

Example:

$x - \sqrt{x} = 3$

a. Target: $u^2 - u = 3$
b. Substitution to try: $u = \sqrt{x}$. Then $u^2 - u = 3$ becomes $(\sqrt{x})^2 - (\sqrt{x}) = 3$ or $x - \sqrt{x} = 3$
c. Then solve for $x$ in terms of $u$
   $u = \sqrt{x}$
   $u^2 = \left(\sqrt{x}\right)^2 = x$ so $x = u^2$
d. Solve the equation in $u$.
   $u^2 - u = 3$
   $u^2 - u - 3 = 0$
   Quadratic formula: $u = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-1) \pm \sqrt{(-1)^2 - 4*1*(-3)}}{2*1} = \frac{1 \pm \sqrt{13}}{2}$

   So solutions in $u$ are $u = \frac{1-\sqrt{13}}{2} \approx -1.30$ and $u = \frac{1+\sqrt{13}}{2} \approx 2.30$

e. Derive solutions for $x$ from the solutions for $u$.
   If $u = \frac{1-\sqrt{13}}{2}$ then $x = u^2 = \left(\frac{1-\sqrt{13}}{2}\right)^2 \approx 1.69$
   If $u = \frac{1+\sqrt{13}}{2}$ then $x = u^2 = \left(\frac{1+\sqrt{13}}{2}\right)^2 \approx 5.30$

   Check the solutions: $x - \sqrt{x} = 3$

   $x = 1.69$ then $1.69 - \sqrt{1.69} \approx 0.39 \neq 3$ so this solution does NOTcheck.
   $x = 5.30$ then $5.30 - \sqrt{5.30} \approx 2.998 \approx 3$ so this solution looks good

   Explanation:
   Why was the first solution NOT good? Go back to the solutions for $u$:
   $u = \frac{1-\sqrt{13}}{2} \approx -1.30$ and $u = \frac{1+\sqrt{13}}{2} \approx 2.30$
   Remember $u = \sqrt{x}$ which is *defined to be non-negative*. So the first solution is not possible. You might remember to look for such things, but you might not, so go ahead and check the solutions in $x$ in the original equation, like I did.