

**YOU & MATHS** Quartic equation? Solve the following equation for  $x$ :

$$x^4 - 5a^2x^2 + 4a^4 = 0.$$

Then find the values of  $a$  such that  $x = 3$  is a solution.

Since  $x^4 = (x^2)^2$ , we can solve the equation for  $x^2$ :

$$(x^2)^2 - 5a^2(x^2) + 4a^4 = 0 \rightarrow x^2 = \frac{5a^2 \pm \sqrt{25a^4 - 16a^4}}{2} = \frac{5a^2 \pm 3a^2}{2}.$$

The solutions are  $x^2 = 4a^2$  or  $x^2 = a^2$ .

Therefore solving for  $x$  we get:

$$x = \pm 2a, x = \pm a.$$

$x = 3$  is a solution of the given equation if:

$$3 = \pm 2a \text{ or } 3 = \pm a.$$

Finally, the values of  $a$  such that  $x = 3$  is a solution of the given equation are:

$$a = \pm \frac{3}{2}, a = \pm 3.$$