

**MAT Exercises – General - Sol'ns (4 pages; 3/11/22)**

(1) (i) Does  $\sqrt{4}$  equal 2 or  $\pm 2$ ? (ii) Simplify  $\sqrt{x^2}$

**Solution**

(i)  $\sqrt{4} = 2$

[By convention, the square root symbol denotes the positive root (consider the  $\pm$  in the quadratic formula, which wouldn't be needed if the square root symbol covered both positive and negative roots). Note that the solution of  $x^2 = 4$  is  $x = \pm\sqrt{4}$ .]

(ii)  $\sqrt{x^2} = |x|$  [Note that  $x$  could be negative.]

(2) Find the square roots of  $49 - 12\sqrt{5}$

**Solution**

$$\text{Let } x^2 = 49 - 12\sqrt{5}$$

$$\text{Consider } x = a + b\sqrt{5}$$

$$\text{Then } a^2 + 2ab\sqrt{5} + 5b^2 = 49 - 12\sqrt{5}$$

$$\text{Let } a^2 + 5b^2 = 49 \text{ \& } 2ab = -12$$

[a variation on Equating Coefficients]

Looking for integer solutions, we see that either

$$a = 2 \text{ \& } b = -3 \text{ or } a = -2 \text{ \& } b = 3 \text{ work.}$$