

## 66.7: Mathematical Subtleties

- When taking the square root of both sides of an equation, a  $\pm$  sign must always be introduced. For example:

$$x^2 = a \Rightarrow x = \pm\sqrt{a} \quad (66.7.1)$$

Both roots may be valid, or, depending on the problem, it may be that one root or the other may be rejected on mathematical or physical grounds.

- Dividing an equation through by a variable may result in losing roots. For example, suppose we have

$$x^2 - ax = 0 \quad (66.7.2)$$

Dividing through by the variable  $x$  will result in one solution,  $x = a$ ; the solution  $x = 0$  has been lost. Instead of dividing through by the variable  $x$ , the proper procedure is to factor out an  $x$  :

$$x(x - a) = 0 \quad (66.7.3)$$

Since the product on the left-hand side is zero, it follows that either  $x = 0$  or  $x - a = 0$  , and we retain both roots.

- The relation

$$\sqrt{x}\sqrt{y} = \sqrt{xy} \quad (66.7.4)$$

is valid only for  $x, y \geq 0$ .

- Some mathematical conventions:
  - 1 is not considered a prime number.
  - $0! = 1$
  - $0^0 = 1$
- When taking an inverse trigonometric function, there will in general be two correct values; your calculator will give only one value, the principal value (P.V.). The other value is found using the table below.

Function	P.V.	Other value
arcsin	$\theta$	$\pi - \theta$
arccos	$\theta$	$-\theta$
arctan	$\theta$	$\pi + \theta$
arcsec	$\theta$	$-\theta$
arccsc	$\theta$	$\pi - \theta$
arccot	$\theta$	$\pi + \theta$

- For  $\arctan(y/x)$ , add  $\pi$  to the calculator's principal value answer if  $x < 0$ .

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