

5.

Solving Trig Equations



with compound angles



Solving Trig Equations

Equations involving trig functions can sometimes involve compound angles such as $(x+45)^\circ$, $(2x-30)^\circ$ etc.

Example 1

Solve algebraically $2 \sin\left(2x + \frac{\pi}{6}\right) = \sqrt{3}$ $(0 \leq x \leq 2\pi)$

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$(0 \leq x \leq 2\pi)$

Solution:

$$\sin(2x + \frac{\pi}{6}) = \frac{\sqrt{3}}{2}$$

$$2x + \frac{\pi}{6} = \sin^{-1}(\frac{\sqrt{3}}{2})$$

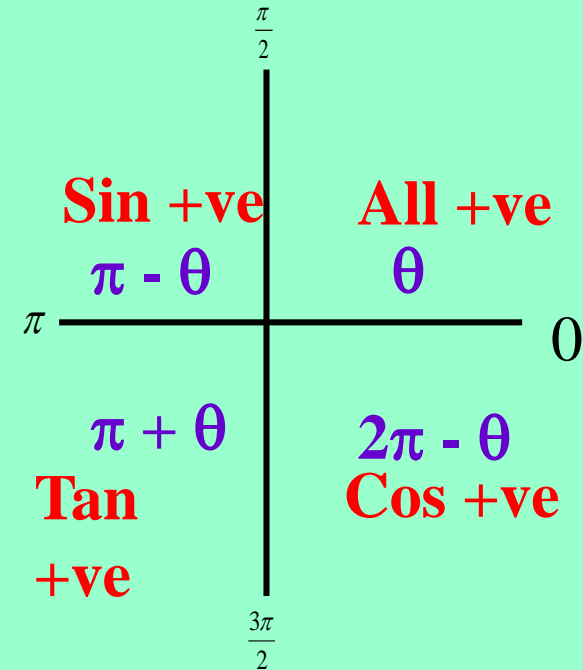
Look for exact values

$$2x + 30^\circ = 60^\circ, 120^\circ,$$

$$2x = 30^\circ, 90^\circ$$

$$x = 15^\circ, 45^\circ, 195^\circ, 225^\circ$$

$$x = \frac{15}{180} \pi, \frac{45}{180} \pi, \frac{195}{180} \pi, \frac{225}{180} \pi$$



Check Period (180°)

$$= \frac{\pi}{12}, \frac{\pi}{4}, \frac{13\pi}{12}, \frac{5\pi}{4}$$

$a^{b/c}$

Example 2

Solve algebraically $4\cos(x-45)^\circ = 1.6$ ($0 \leq x^\circ \leq 180$)

take note
of interval

Solution:

$$\cos(x-45)^\circ = \frac{1.6}{4} = 0.4$$

$$(x-45)^\circ = \cos^{-1}(0.4)$$

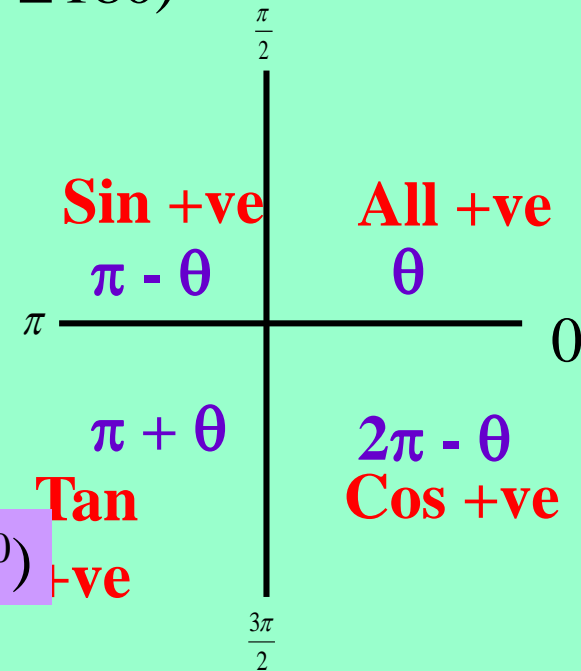
$$(x-45)^\circ = 66.4^\circ, 293.6^\circ$$

Check Period (360°)

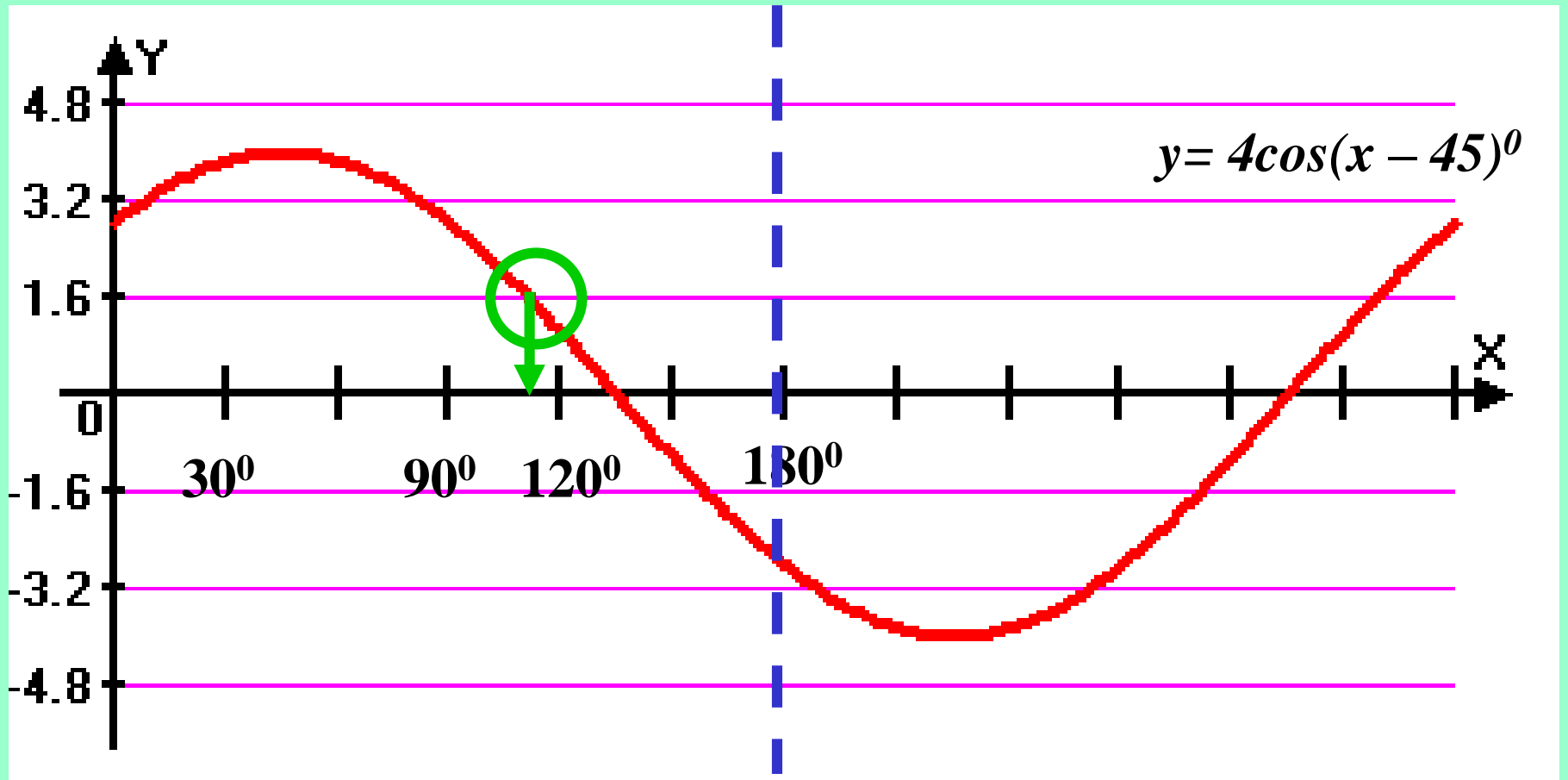
$$x^\circ = (66.4 + 45)^\circ, (293.6 + 45)^\circ$$

$$x^\circ = 111.4^\circ$$

OUTSIDE INTERVAL



THE PROOF



Heinemann, p.65, EX 4I
Q1 to 3