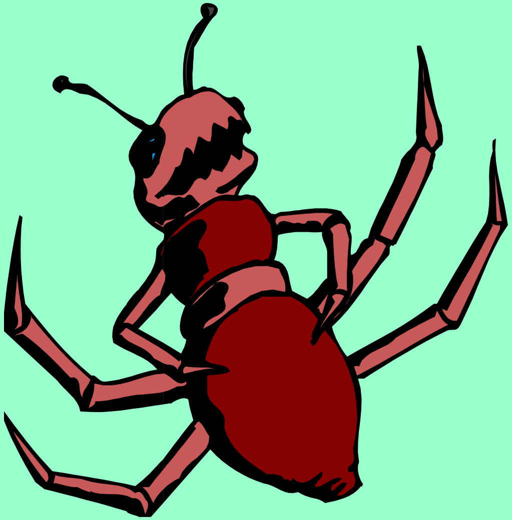


4.

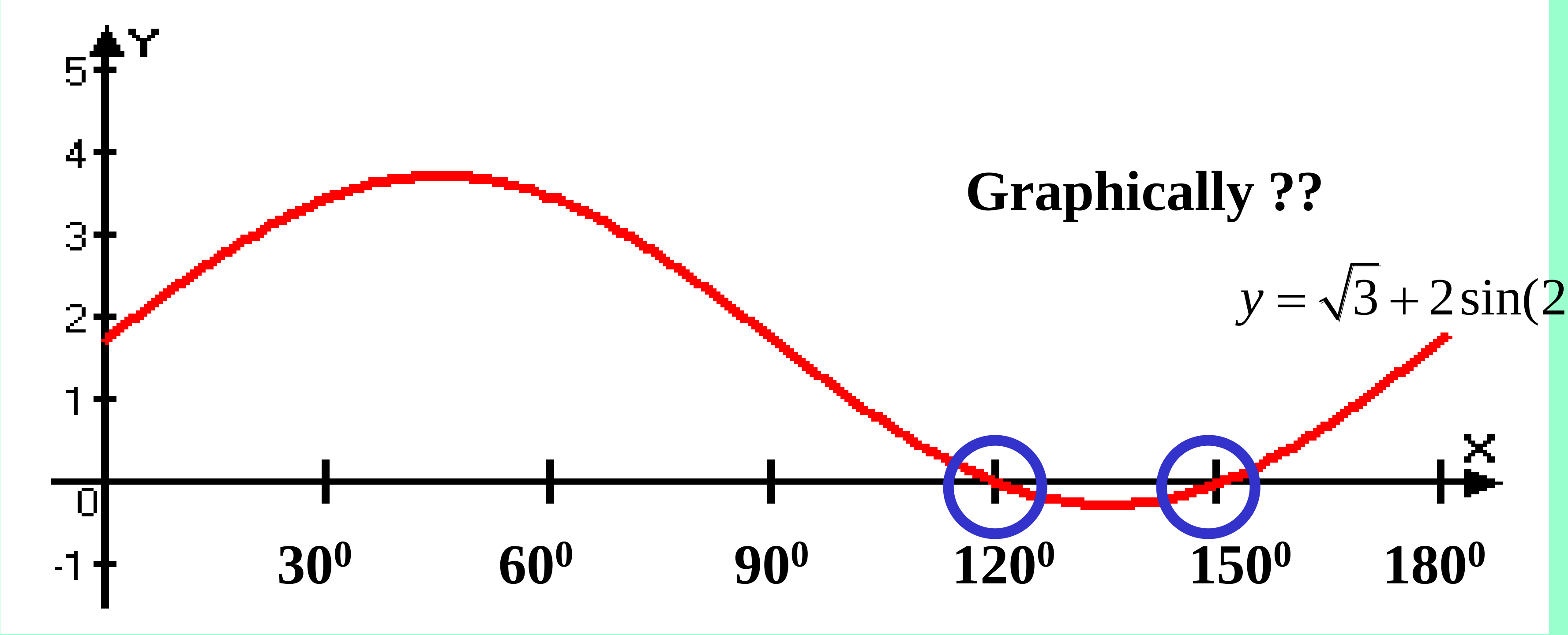
Solving Trig Equations

Solving Trig Equations

Equations involving trig functions can be solved graphically but it is usually easier (and more accurate) to solve them algebraically.

Example 1

Solve algebraically $\sqrt{3} + 2\sin(2x) = 0 \quad (0 \le x \le \pi)$



Solving Trig Equations

Always take note of interval

Example 1

Solve algebraically $\sqrt{3} + 2\sin(2x) = 0 \quad (0 \le x \le \pi)$

Solution:

$$2\sin 2x = -\sqrt{3}$$

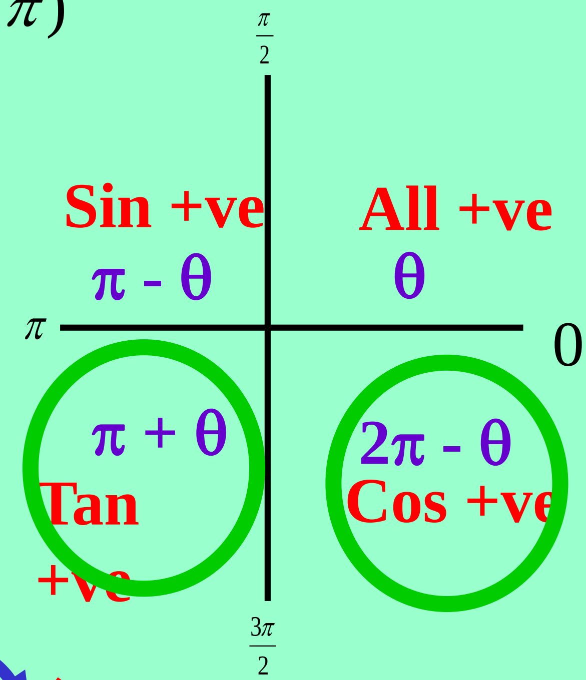
$$\sin 2x = -\frac{\sqrt{3}}{2}$$

Look for exact values

$$2x = -\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$$

$$2x = -(60^0)$$

$$2x = (180+60),(360-60)$$



Check Period : Graph is of 2***x*** so P =180^0

$$x = 120^0, 150^0 \quad 300^0, 330^0$$

OUTSIDE INTERVAL

$$x = \frac{120}{180}\pi, \frac{150}{180}\pi \quad = \frac{2\pi}{3}, \frac{5\pi}{6}$$

$a\ ^b/_c$

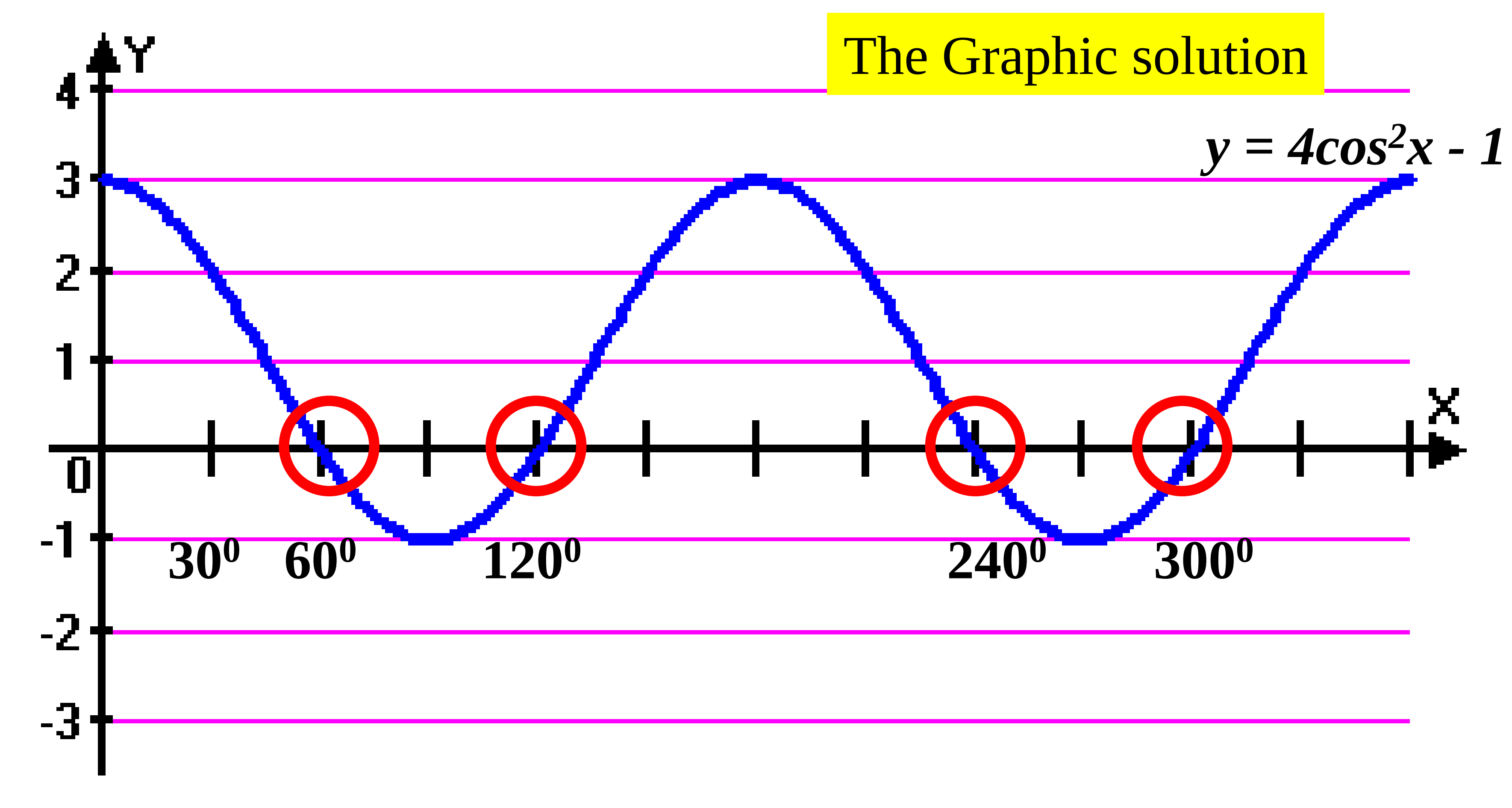
Heinemann, p.63, EX 4H, Q1

This is not the end

Example 2

Solve algebraically $4\cos^2 x - 1 = 0 \qquad (0 \le x \le 2\pi)$

Solution:



Example 2

Solve algebraically $4\cos^2 x - 1 = 0 \qquad (0 \le x \le 2\pi)$

Always take note of interval

Solution:

$$4\cos^2 x = 1$$

$$\cos^2 x = \frac{1}{4}$$

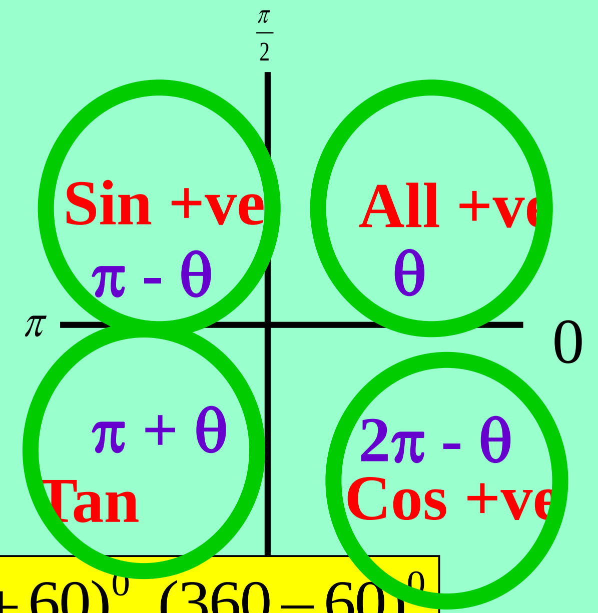
$$\cos x = \sqrt{\frac{1}{4}}$$

Look for exact values

$$\cos x = \pm \tfrac{1}{2}$$

$$x = \pm \cos^{-1}(\tfrac{1}{2})$$

$$\cos 60^0 = \tfrac{1}{2}$$



$$x = 60^0, (180-60)^0, (180+60)^0, (360-60)^0$$

Check Period (360^0)

$$x = 60^0, 120^0, 240^0, 300^0$$

a b/c

$$x = \frac{60}{180}\pi, \frac{120}{180}\pi, \frac{240}{180}\pi, \frac{300}{180}\pi \quad = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$$

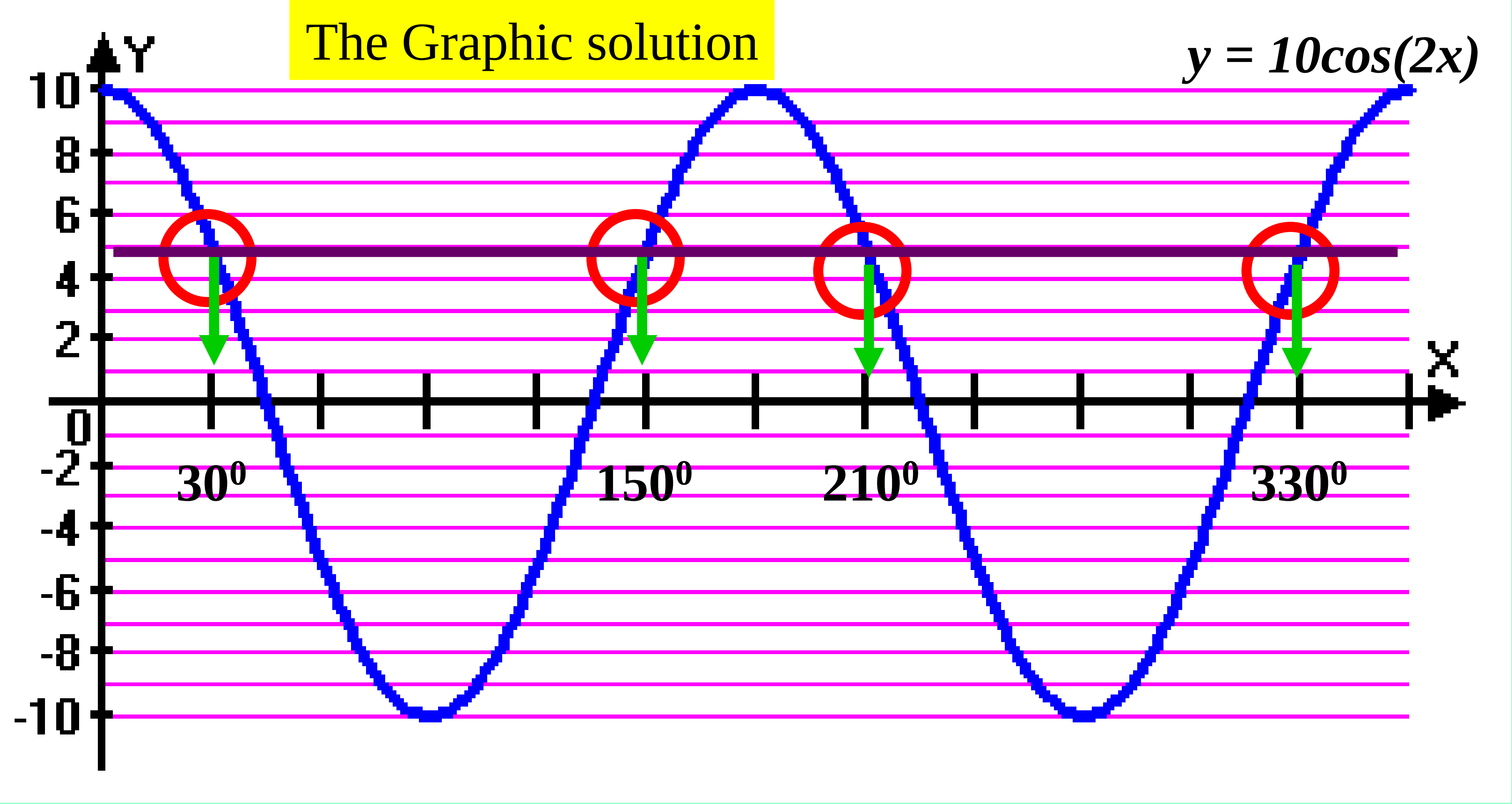
Heinemann, p.63, EX 4H,
Q2

This is not the end

Example 3

Solve algebraically $10\cos(2x) = 5 \qquad (0 \le x \le 2\pi)$

Solution:



Example 3

Always take note of interval

Solve algebraically $10\cos(2x) = 5 \qquad (0 \le x \le 2\pi)$

Solution:

$$\cos(2x) = \frac{5}{10} = \frac{1}{2}$$

Look for exact values

$$2x = \cos^{-1}\left(\frac{1}{2}\right)$$

Check Period :

For graph of cos 2***x***

P = 180^0

$$2x = 60^0, (360 - 60)^0,$$

$$2x = 60^0, 300^0$$

$$x = 30^0, 150^0 \quad 210^0, 330^0$$

$$x = \frac{30}{180}\pi, \frac{150}{180}\pi, \frac{210}{180}\pi, \frac{330}{180}\pi$$

$a\,{}^{b}/_{c}$

$$= \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$$

Heinemann, p.63, EX 4H, Q4

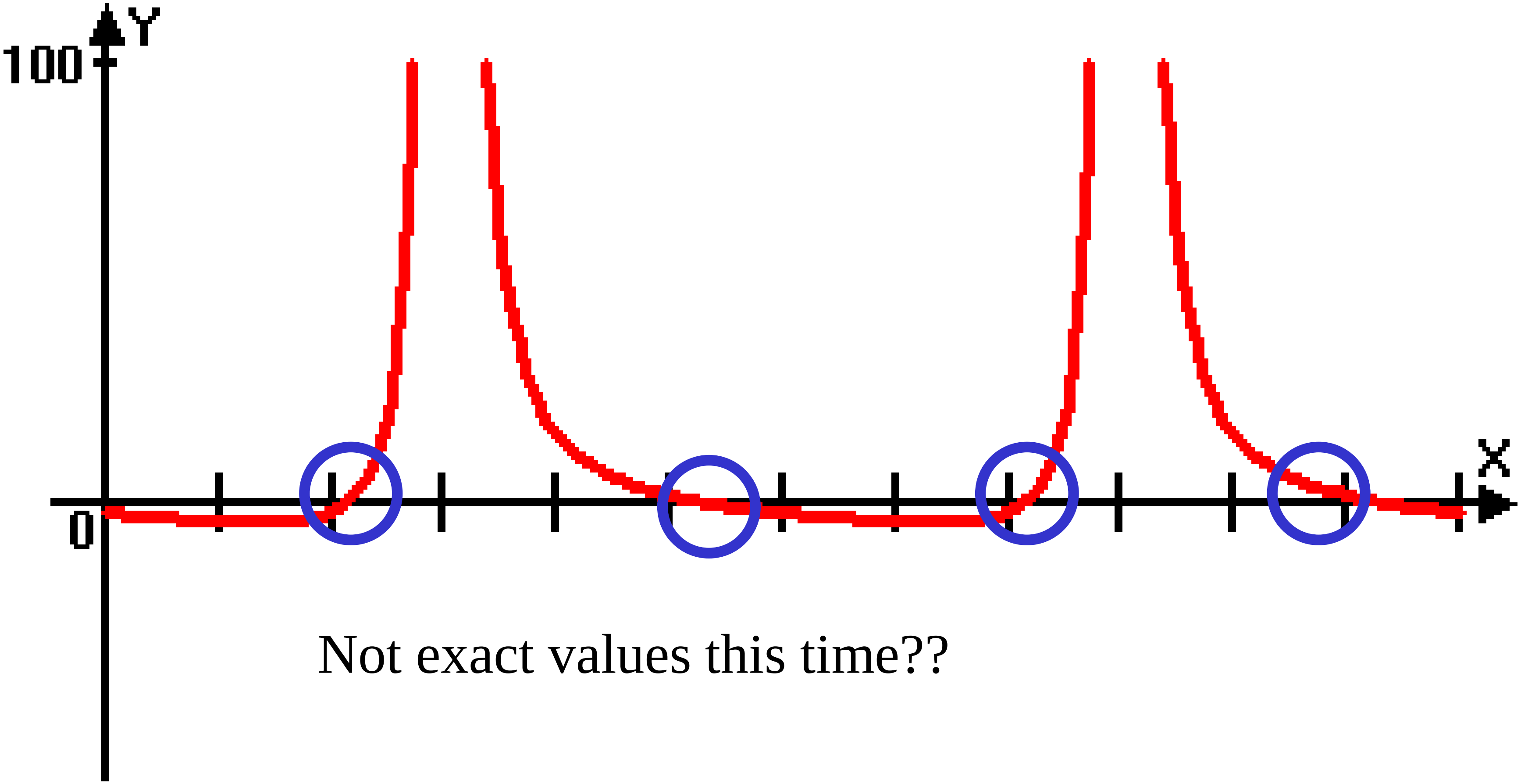
This is not the end

Example 4

Solve algebraically $3\tan^2 x - 5\tan x - 2 = 0 \quad (0 \le x^0 \le 360)$

Solution:

The Graphic solution



Not exact values this time??

Example 4

Solve algebraically $3\tan^2 x - 5\tan x - 2 = 0 \quad (0 \le x^0 \le 360)$

Solution:

Let y = tan x

Factors

3	2
1	1

-2 x 1

2 x -1

$$3y^2 - 5y - 2 = 0$$

$$(3y + 1)\quad(y - 2) = 0$$

$$y = -\tfrac{1}{3} \quad \text{or} \quad y = 2$$

$$\tan x = -\tfrac{1}{3} \quad \text{or} \quad \tan x = 2$$

$$x = -\tan^{-1}(\tfrac{1}{3}) \quad \text{or} \quad x = \tan^{-1}(2)$$

$$x = (180 - 18.4)^0, (360 - 18.4)^0 \quad \text{or} \quad x = (63.4)^0, (180 + 63.4)^0$$

$$x = 161.6^0, 341.6^0 \quad \text{or} \quad x = 63.4^0, 243.4^0$$

$$x = 63.4^0, 161.6^0, 243.4^0, 341.6^0$$

Example 4

Solve algebraically $3\tan^2 x - 5\tan x - 2 = 0 \quad (0 \le x^0 \le 360)$

Solution:

Let y = tan x

$$y = \frac{5 \pm \sqrt{(-5)^2 - 4(3)(-2)}}{2(3)}$$

$$y = \frac{5 \pm \sqrt{49}}{6}$$

$$3y^2 - 5y - 2 = 0$$

Factors

3	2
1	1

-2 x 1

2 x -1

$(3y + 1) \quad (y - 2) = 0$

$y = -\frac{1}{3}$ or $y = 2$

$\tan x = -\frac{1}{3}$ or $\tan x = 2$

$x = -\tan^{-1}(\frac{1}{3})$ or $x = \tan^{-1}(2)$

$x = (180 - 18.4)^0, (360 - 18.4)^0$ or $x = (63.4)^0, (180 + 63.4)^0$

$x = 161.6^0, 341.6^0$ or $x = 63.4^0, 243.4^0$

$$x = 63.4^0, 161.6^0, 243.4^0, 341.6^0$$

Heinemann, p.63, EX 4H, Q 5