Solutions

Pythagoras' Theorem

Pythagoras' Theorem in Circles

The Graphs of Trigonometric Functions

Trigonometric Equations

Pythagoras' Theorem

Q1 a) $3^2 + 5^2 = c^2$

$9 + 25 = c^2$

$34 = c^2$

$c = \sqrt{34}$

$c = 5.83$ units

b) $5^2 + 12^2 = c^2$

$25 + 144 = c^2$

$169 = c^2$

$c = \sqrt{169}$

$c = 13$ units

c) $10^2 + 13^2 = c^2$

$100 + 169 = c^2$

$269 = c^2$

$c = \sqrt{269}$

$c = 16.4$ units

d) $a^2 + 24^2 = 25^2$

$a^2 = 25^2 - 24^2$

$a^2 = 625 - 576$

$a^2 = 49$

$a = \sqrt{49}$

$a = 7$ units

e) $a^2 + 7^2 = 12^2$

$a^2 = 12^2 - 7^2$

$a^2 = 144 - 49$

$a^2 = 95$

$a = \sqrt{95}$

$a = 9.75$ units

f) $a^2 + 9^2 = 17^2$

$a^2 = 17^2 - 9^2$

$a^2 = 289 - 81$

$a^2 = 208$

$a = \sqrt{208}$

$a = 14.4$ *units*

Q2 a) $20^2 + 21^2 = 400 + 441 = 841$

$29^2 = 841$

Since $20^2 + 21^2 = 29^2$ the triangle is right-angled.

b) $9^2 + 40^2 = 81 + 1600 = 1681$

$41^2 = 1681$

Since $9^2 + 40^2 = 41^2$ the triangle is right-angled.

c) $8^2 + 9^2 = 64 + 81 = 145$

$12^2 = 144$

Since $8^2 + 9^2 \neq 12^2$ the triangle is not right-angled.

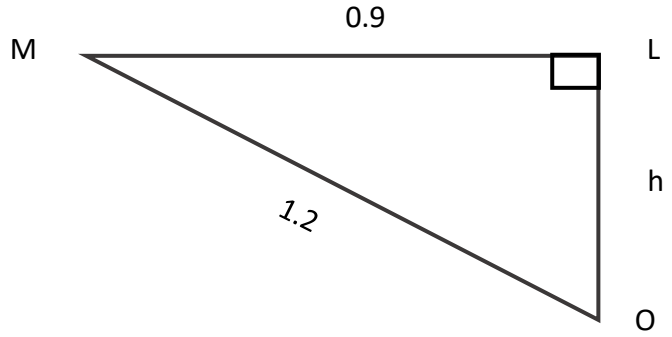
d) $20^2 + 25^2 = 400 + 625 = 1025$

$32^2 = 1024$

Since $20^2 + 25^2 \neq 32^2$ the triangle is not right-angled.

Pythagoras' Theorem in Circles

Q1) Construct a right triangle from the midpoint of ML with O & M.



Using Pythagoras gives

$1.2^2 = 0.9^2 + h^2$

Solving gives $h = 0.79\ m$

So, depth of milk $= 0.79 + radius = 0.79 + 1.2 = 2.78\ m$

Q2) Let M be the mid-point of AB

Construct a right-angled triangle OAM

Using Pythagoras, $13^2 - 10^2 = 169 - 100 = 69$

$\sqrt{69} = 8.3$

Width = Radius + 8.3 = 13 + 8.3 = 21.3 cm

Q3) Let M be the mid-point of AB

Construct a right-angled triangle OMB

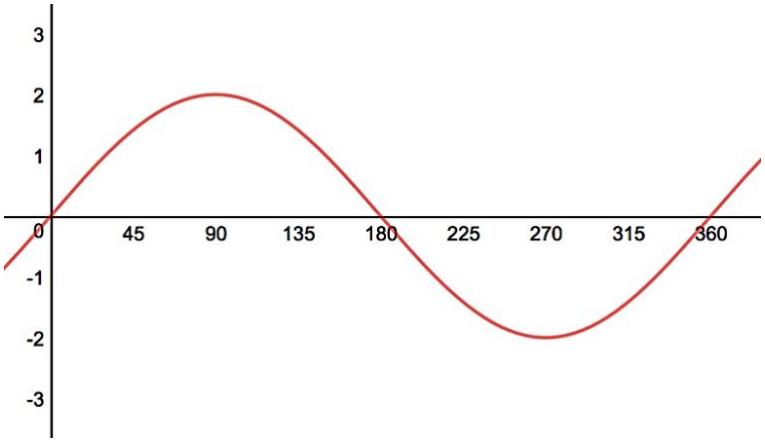
Using Pythagoras, $6.6^2 - 4.5^2 = 43.56 - 20.25 = 23.31$

$\sqrt{23.31} = 4.83$

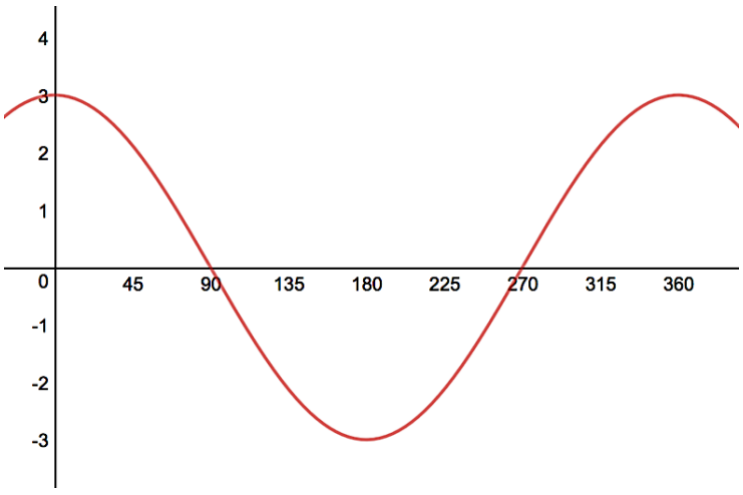
Height = 4.83 + 6.6 = 11.43 cm

The Graphs of Trigonometric Functions

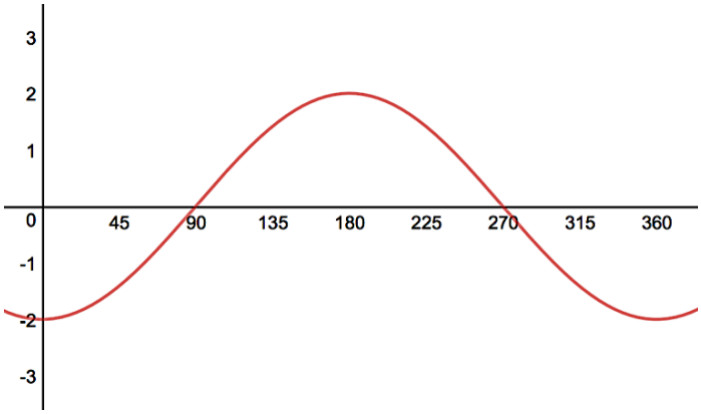
Q1 a) $y = 2\ sin\ x$



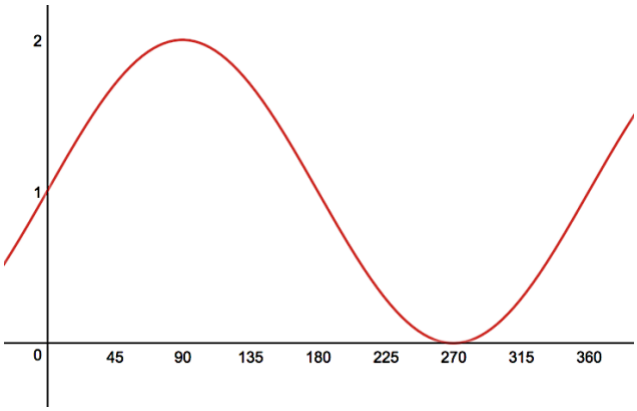
b) $y = 3\ cos\ x$



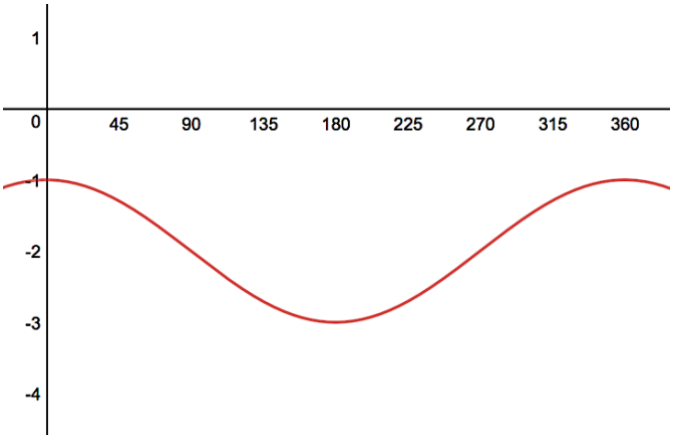
c) $y = -2\ cos\ x$



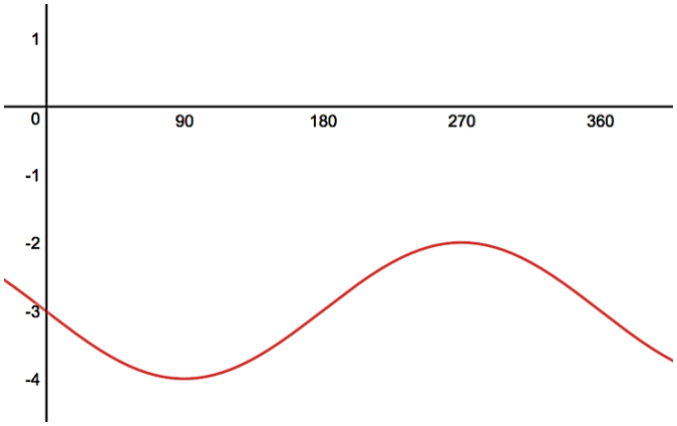
Q2 a) $y = \sin x + 1$



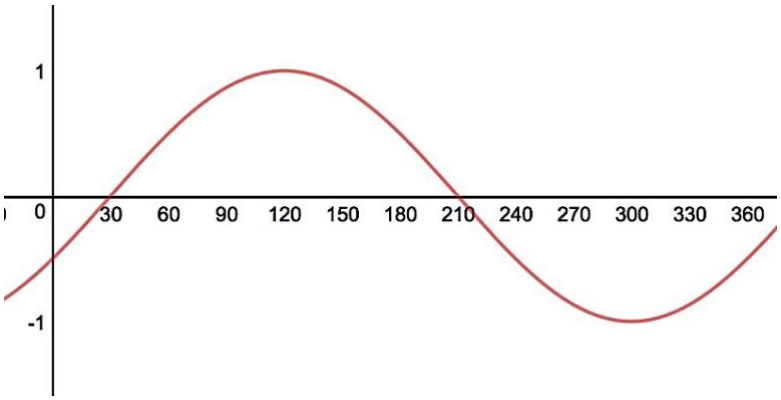
b) $y = cos\ x - 2$



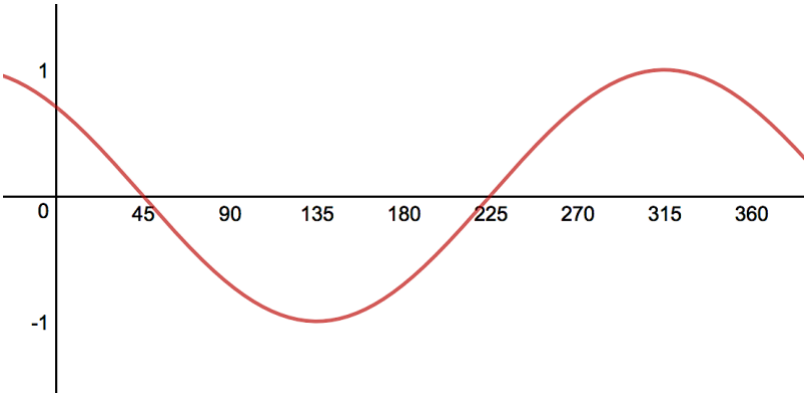
c) $y = -sin\ x - 3$



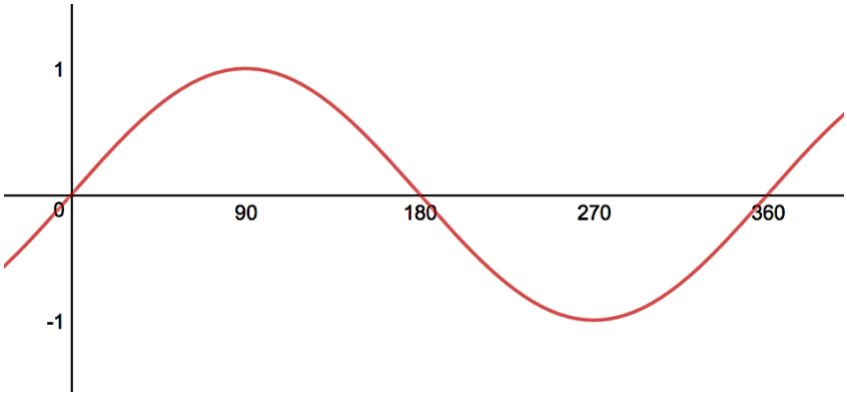
Q3 a) $y = sin\ (x - 30)°$



b) $y = cos(x + 45)°$

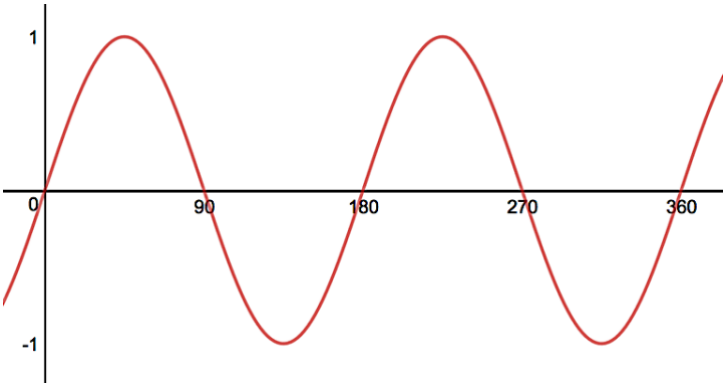


c) $y = cos(x - 90)°$



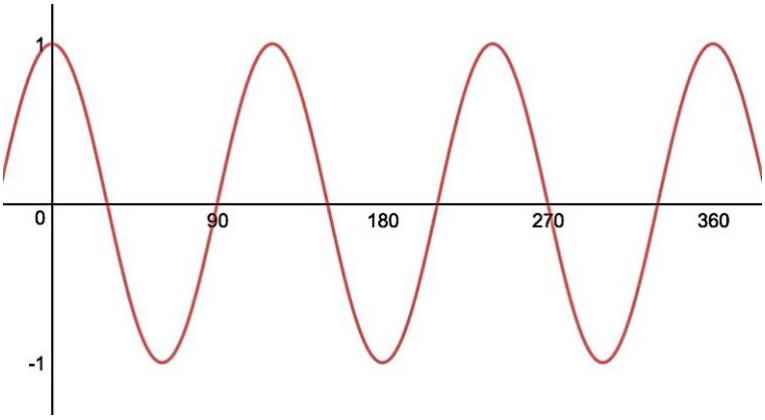
Q4 a) $y = sin\ 2x$

Period $= 360 \div 2 = 180°$



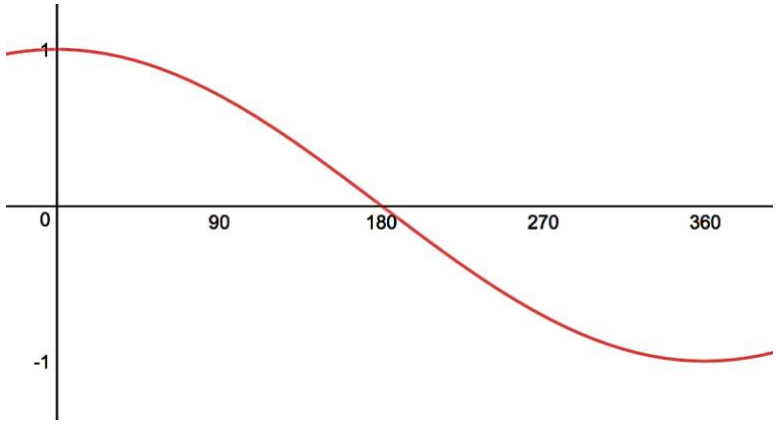
b) $y = cos\ 3x$

Period $= 360 \div 3 = 120°$



c) $y = cos\frac{1}{2}x$

Period $= 360 \div \frac{1}{2} = 720°$



Q5 a) $a = 2, b = 3$

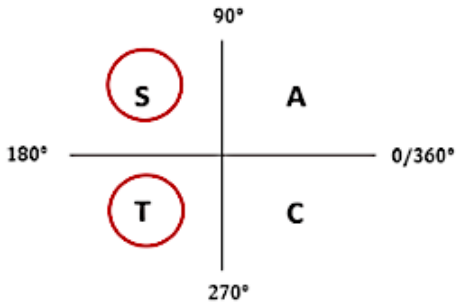
b) $a = 3, b = 45$

c) $a = -2$

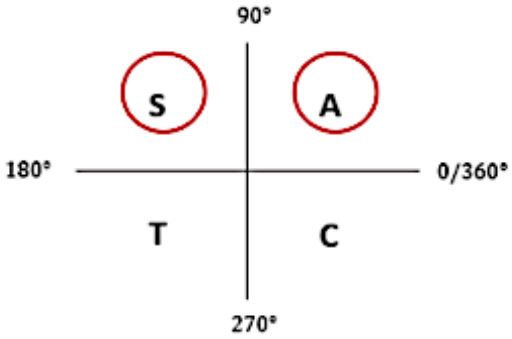
d) $a = 3, b = 45$

Trigonometric Equations

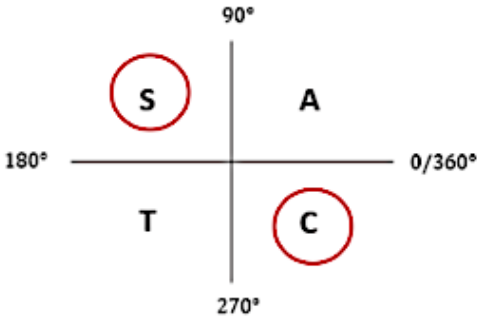
Q1 a) $\cos x = -0.8$



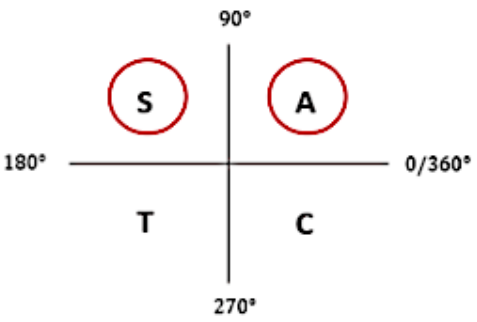
b) $\sin x = 0.79$



c) $\tan x = -2.5$

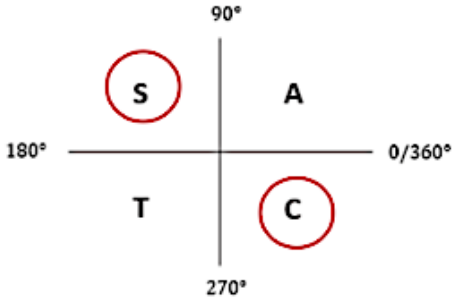


d) $2\sin x - 1 = -0.6, \sin x = 0.2$



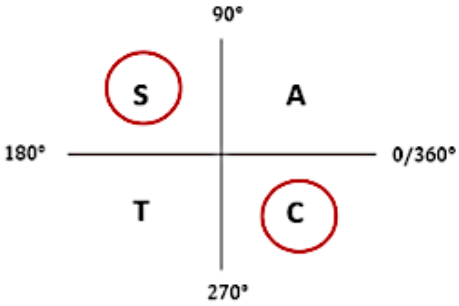
e) $3\tan x + 2 = -1$

$\tan x = -1$

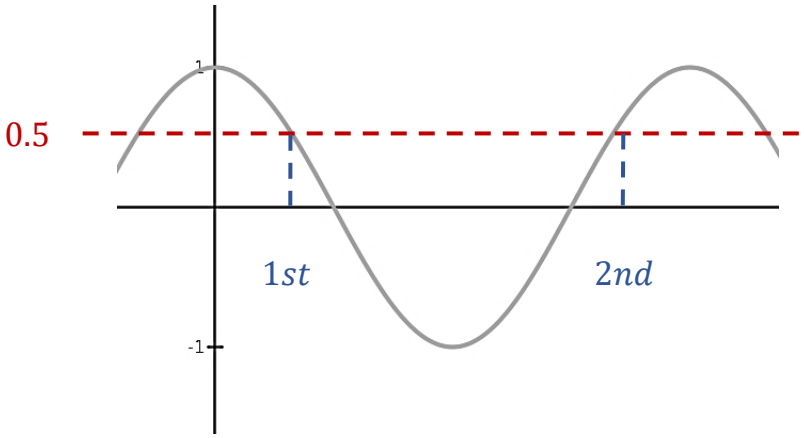


f) $\sin x + 1.5 = 2.1$

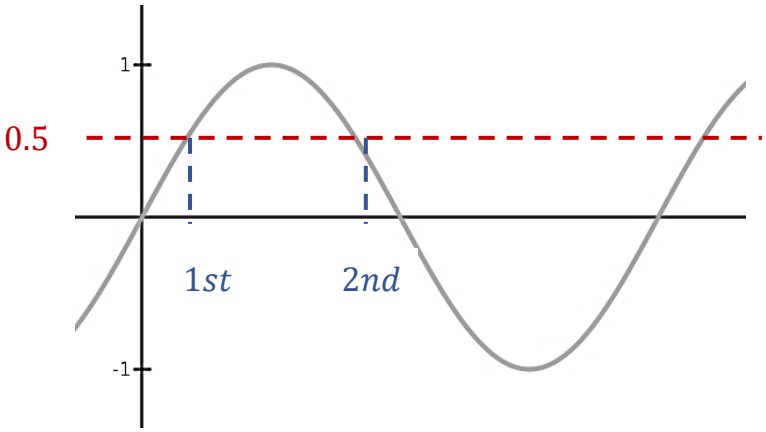
$\sin x = 0.6$



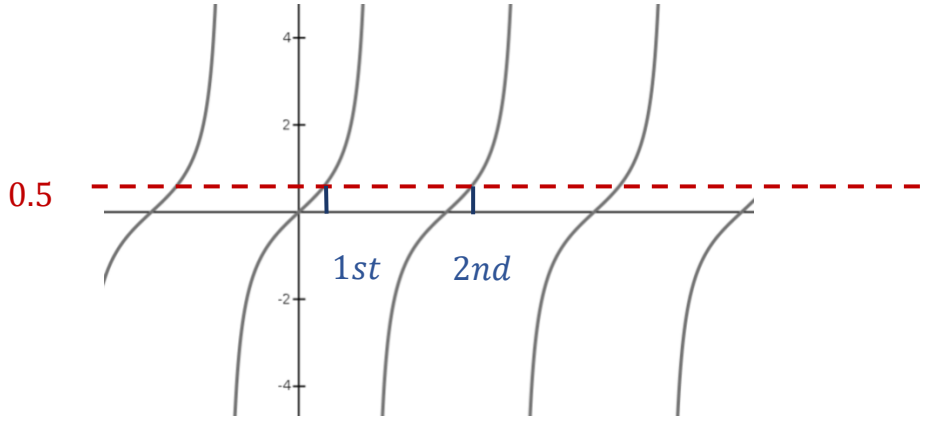
Q2 a) $cos\, x = 0.5$



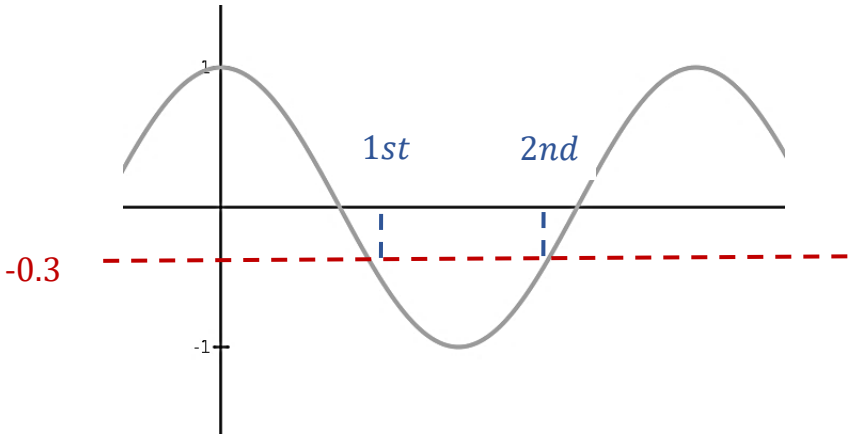
b) $sin\, x = 0.5$



c) $tan\, x = 0.5$



d) $cos\, x = -0.3$



Q3 a) $\tan x = 0.192$

Using CAST the solutions are in quadrants 1 and 3

$tan^{-1}(0.192) = 10.9°$

Second solution is $180 + 10.9 = 190.9°$

So, $x = 10.9°, x = 190.9°$

b) $\cos x = 0.464$

Using CAST the solutions are in quadrants 1 and 4

$cos^{-1}(0.464) = 62.4°$

Second solution is $360 - 62.4 = 297.6°$

So, $x = 62.4°, x = 297.6°$

c) $\sin x = -0.243$

Using CAST the solutions are in quadrants 3 and 4

$sin^{-1}(0.243) = 14.1$

First solution is $180 + 14.1 = 194.1°$

Second solution is $360 - 14.1 = 345.9°$

So, $x = 194.1°, x = 345.9°$

d) $\sin x = 0.258$

Using CAST the solutions are in quadrants 1 and 2

$sin^{-1}(0.258) = 14.9°$

Second solution is $180 - 14.9 = 165.1°$

So, $x = 14.9°, x = 165.1°$

e) $\tan x = -1.23$

Using CAST the solutions are in quadrants 2 and 4

$tan^{-1}(1.23) = 50.9$

First solution is $180 - 50.9 = 129.1°$

Second solution is $360 - 50.9 = 309.1°$

f) $\cos x = -0.5$

Using CAST the solutions are in quadrants 2 and 3

$cos^{-1}(0.5) = 60$

First solution is $180 - 60 = 120°$

Second solution is $360 - 120 = 240°$

So, $x = 120°, x = 240°$

Q4 a) $3\cos x - 1 = 0$

$$\cos x = \frac{1}{3}$$

Using CAST the solutions are in quadrants 1 and 4

$cos^{-1}\left(\frac{1}{3}\right) = 70.5°$

Second solution is $360 - 70.5 = 289.5°$

So, $x = 70.5°, x = 289.5°$

b) $2\tan x - 2 = 0$

$2\tan x = 2$

$\tan x = 1$

Using CAST the solutions are in quadrants 1 and 3

$tan^{-1}(1) = 45°$

Second solutions is $180 + 45 = 225°$

So, $x = 45°, x = 225°$

c) $5\ cos\ x + 4 = 0$

$5\cos x = -4$

$\cos x = -0.8$

Using CAST the solutions are in quadrants 2 and 3

$cos^{-1}(0.8) = 36.9°$

First solution is $180 - 36.9 = 143.1°$

Second solution is $180 + 36.9 = 216.9°$

So, $x = 143.1°, x = 216.9°$

d) $\tan x + 1 = 0$

$tan\ x = -1$

Using CAST the solutions are in quadrants 2 and 4

$tan^{-1}(1) = 45$

First solution is $180 - 45 = 135°$

Second solution is $360 - 45 = 315°$

So, $x = 135°, x = 315°$