Topic: Trig Equations (SATC)

19.01

$11\cos x - 2 = 3$

$11\cos x = 5$

$\cos x = 5/11$

$x_1 = \cos^{-1}(5/11) = 63°$

$x_2 = 360 - 63 = 297°$

$180-x$	x
S | A ✓	positive!
T | C ✓	
$180+x$	$360-x$

19.02

$5\tan x - 9 = 0$

$5\tan x = 9$

$\tan x = 9/5$

$x_1 = \tan^{-1}(9/5) = 60.9°$

$x_2 = 180 + 60.9 = 240.9°$

$180-x$	x ✓
S | A	positive!
✓ T | C	
$180+x$	$360-x$

19.03

$5\sin x + 2 = 0$

$5\sin x = -2$

$\sin x = -2/5$

$x = \sin^{-1}(2/5) = 23.6°$

Negative!

$180-x$	S | A x
✓	T | C ✓
$180+x$	$360-x$

$x_1 = 180 + 23.6 = 203.6°$

$x_2 = 360 - 23.6 = 336.4°$

19.04

$2\tan x° + 7 = 0$

$2\tan x° = -7$

$\tan x° = -7/2$

$x = \tan^{-1}(7/2) = 74°$

Negative!

$180-x$ ✓	S | A x
T | C ✓	$360-x$
$180+x$	

$x_1 = 180 - 74° = 106°$

$x_2 = 360 - 74° = 286°$

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19.05

$7\sin x - 3 = 0$

$7\sin x = 3$

$\sin x = 3/7$

$x_1 = \sin^{-1}(3/7) = 25.4^\circ$

$x_2 = 180 - 25.4^\circ = 154.6^\circ$

$180-x$ ✓ S	A x ✓
T	C
$180+x$	$360-x$

positive!

19.06

$7\cos x - 5 = 0$

$7\cos x = 5$

$\cos x = 5/7$

$x_1 = \cos^{-1}(5/7) = 44.4^\circ$

$x_2 = 360 - 44.4^\circ = 315.6^\circ$

$180-x$ S	A x ✓
T	C ✓
$180+x$	$360-x$

positive!

19.07

$5\tan x^\circ - 6 = 2$

$5\tan x^\circ = 8$

$\tan x^\circ = 8/5$

$x_1 = \tan^{-1}(8/5) = 58^\circ$

$x_2 = 180 + 58^\circ = 238^\circ$

$180-x$ S	A x ✓
✓T	C
$180+x$	$360-x$

positive!

19.08

$4\cos x + 3 = 0$

$4\cos x = -3$

$\cos x = -3/4$

$x = \cos^{-1}(3/4) = 41.4^\circ$

$180-x$ ✓S	A x
✓T	C
$180+x$	$360-x$

Negative!

$x_1 = 180 - 41.4^\circ = 138.6^\circ$

$x_2 = 180 + 41.4^\circ = 221.4^\circ$

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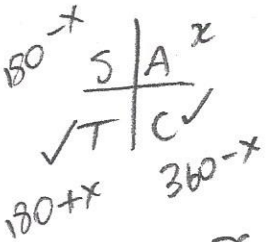
19.09

$7\sin x^\circ + 1 = -5$

$7\sin x^\circ = -6$

$\sin x^\circ = -6/7$

$x = \sin^{-1}(6/7) = 59^\circ$



Negative!

$x_1 = 180 + 59^\circ = 239^\circ$

$x_2 = 360 - 59^\circ = 301^\circ$

19.10

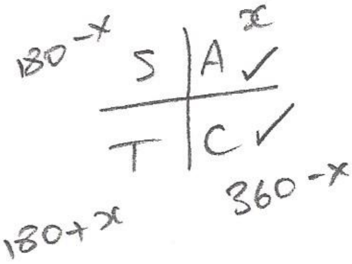
$5\cos x^\circ - 3 = 1$

$5\cos x^\circ = 4$

$\cos x^\circ = 4/5$

$x_1 = \cos^{-1}(4/5) = 36.9^\circ$

$x_2 = 360 - 36.9^\circ = 323.1^\circ$



Positive!

19.11

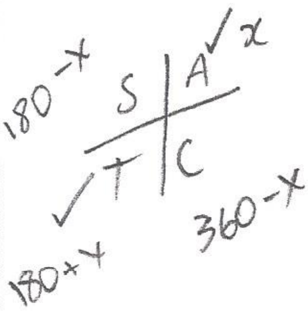
$2\tan x^\circ - 3 = 5$

$2\tan x^\circ = 8$

$\tan x^\circ = 8/2$

$x_1 = \tan^{-1}(8/2) = 76^\circ$

$x_2 = 180 + 76^\circ = 256^\circ$



Positive!

19.12

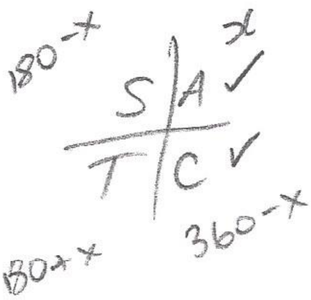
$7\cos x^\circ - 2 = 0$

$7\cos x^\circ = 2$

$\cos x^\circ = 2/7$

$x_1 = \cos^{-1}(2/7) = 73.4^\circ$

$x_2 = 360 - 73.4^\circ = 286.6^\circ$



Positive!

Topic: Trig Equations (SATC)

19.13

$2 + 3\sin x^\circ = 0$

$3\sin x^\circ = -2$

$\sin x^\circ = -2/3$

$x = \sin^{-1}(2/3) = 41.8^\circ$

S	A
T ✓	C ✓

$180 - x$, x, $180 + x$, $360 - x$

Negative!

$x_1 = 180 + 41.8^\circ = 221.8^\circ$

$x_2 = 360 - 41.8^\circ = 318.2^\circ$

19.14

$4\sin x^\circ + 1 = -2$

$4\sin x^\circ = -3$

$\sin x^\circ = -3/4$

$x = \sin^{-1}(3/4) = 48.6^\circ$

S	A
T ✓	C ✓

$180 - x$, x, $180 + x$, $360 - x$

Negative!

$x_1 = 180 + 48.6^\circ = 228.6^\circ$

$x_2 = 360 - 48.6^\circ = 311.4^\circ$

19.15a

$\sqrt{3}\sin x^\circ - 1 = 0$

$\sqrt{3}\sin x^\circ = 1$

$\sin x^\circ = 1/\sqrt{3}$

$x_1 = \sin^{-1}(1/\sqrt{3}) = 35.3^\circ$

$x_2 = 180 - 35.3^\circ = 144.7^\circ$

S ✓	A ✓
T	C

$180 - x$, x, $180 + x$, $360 - x$

Positive!

19.15b

$\sqrt{3}\sin 2x - 1 = 0$

$\sqrt{3}\sin 2x = 1$

$\sin 2x = \frac{1}{\sqrt{3}}$

$2x_1 = \sin^{-1}(1/\sqrt{3}) = 35.3^\circ$

$2x_2 = 180 - 35.3^\circ = 144.7^\circ$

S	A
T	C

$180 - x$, x, $180 + x$, $360 - x$

Positive!

$x_1 = \frac{35.3}{2} = 17.65^\circ$ $\quad x_2 = \frac{144.7}{2} = 72.35^\circ$

Topic: Trig Equations (SATC)

19.16 $H = 10 + 5\sin t°$

a) $t = 10 \rightarrow H = 10 + 5\sin(10)$
$= 10.87\text{ m}$

b) $H = 12.5 \rightarrow 12.5 = 10 + 5\sin t°$

$5\sin t° = 2.5$
$\sin t° = 2.5/5$
$t_1° = \sin^{-1}(2.5/5) = 30°$

S: $180 - x$ ✓; A: x ✓; T: $180 + x$; C: $360 - x$

$t_2 = 180 - 30° = 150°$

Positive!

19.17 $h = -31\cos t° + 33$

a) $t = 20 \rightarrow h = -31\cos(20) + 33$
$= 3.87\text{ m}$

b) $h = 60 \rightarrow 60 = -31\cos t° + 33$

$-31\cos t° = -27$
$\cos t° = 27/31$

$t_1 = \cos^{-1}(27/31) = 29.4°$

S: $180 - x$; A: x ✓; T: $180 + x$; C: $360 - x$ ✓

$t_2 = 360 - 29.4°$
$= 330.6°$

Positive!

19.18 $h = 8 + 4\sin t°$

a) $t = 30 \rightarrow h = 8 + 4\sin(30)$
$= 10$

b) $h = 10.5 \rightarrow 10.5 = 8 + 4\sin t°$

$4\sin t° = 2.5$
$\sin t° = 2.5/4$
$t_1° = \sin^{-1}(2.5/4) = 38.68°$
$t_2° = 180 - 38.68° = 141.32°$

S: $180 - x$ ✓; A: x ✓; T: $180 + x$; C: $360 - x$

Positive!

19.19 $h = 15\tan x° + 1.7$

a) $x = 25° \rightarrow h = 15\tan 25 + 1.7$
$= 8.69$

b) $h = 18.4 \rightarrow 18.4 = 15\tan x° + 1.7$

$15\tan x° = 16.7$
$\tan x° = 16.7/15$

$x_1 = \tan^{-1}(16.7/15) = 48.07°$
$x_2 = 180 + 48.07° = 228.07°$

S: $180 - x$; A: x ✓; T: $180 + x$ ✓; C: $360 - x$

Positive!