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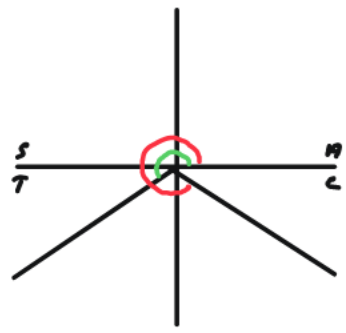
10.4 Simple trigonometric equations

1) a) $\sin x = -0.6$

$x = \sin^{-1}(-0.6)$

$x = -36.9$

b)



$x = 216.9,\ 323.1$

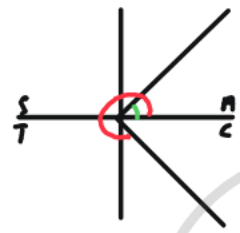
1) $180 + 36.9 = 216.9$

2) $360 - 36.9 = 323.1$

2) $\cos = \frac{1}{\sqrt{2}}$

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

$\theta = 45$



$360 - 45 = 315$

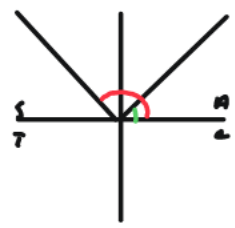
$\theta = 45, 315$

3) $4\sin x = 3$

$\sin x = \frac{3}{4}$

$x = \sin^{-1}\left(\frac{3}{4}\right)$

$x = 48.6$



$180 - 48.6 = 131.4$

$\theta = 48.6,\ 131.4$

4) $\sin\theta = -10\cos\theta$

$\frac{\sin\theta}{\cos\theta} = -10\frac{\cos\theta}{\cos\theta}$

$\tan\theta = -10$

$\theta = \tan^{-1}(-10)$

$\theta = -84.3$

$\theta_1 = -84.3 + 180$

$\theta_2 = -84.3 + 240$

$\theta = 95.7,\ 275.7$

5) a) Line 3: Divided both sides by $\sin x$ and lost the solutions for $\sin x = 0$

Line 6: Has not identified the negative solution for $\cos x = \frac{5}{9}$

b) $5\tan x = 9\sin x$

$$5\frac{\sin x}{\cos x} = 9\sin x$$

$$5\frac{\sin x}{\cos x \sin x} = 9\frac{\sin x}{\sin x}$$

$$5\frac{1}{\cos x} = 9$$

$$5 = 9\cos x$$

$$\cos x = \frac{5}{9}$$

$x = -56.3, 0, 56.3$ in the interval $-90^\circ < x < 90^\circ$

6) a) $3\sin\theta = 5\cos\theta$

$$\frac{3\sin\theta}{\cos\theta} = \frac{5\cos\theta}{\cos\theta}$$

$$3\tan\theta = 5$$

$$\tan\theta = \frac{5}{3}$$

b) $\theta = 59.0, 239.0$

7) $\cos^2 x = \frac{3}{4}$

$$\cos x = \pm\sqrt{\frac{3}{4}}$$

$x = \cos^{-1}\left(+\sqrt{\frac{3}{4}}\right)$ $\quad$ $x = \cos^{-1}\left(-\sqrt{\frac{3}{4}}\right)$

$x = 30$ $\quad$ $x = 150$

$x = \pm 30, \pm 150$ in the interval $-180 \leq x < 180$

8) a) $4\cos^2 - 3\sin^2 x = 1$

$$4\cos^2 - 3(1 - \cos^2 x) = 1$$

$$4\cos^2 - 3 + 3\cos^2 x = 1$$

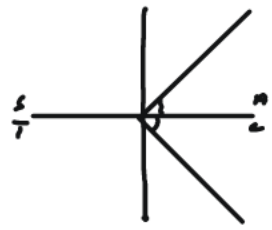
$$7\cos^2 = 4$$

8) b) $7\cos^2 x = 4$

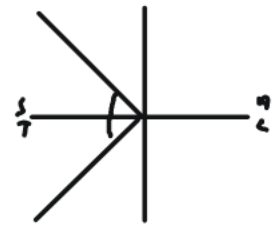
$\cos^2 x = \frac{4}{7}$

$\cos x = \pm\sqrt{\frac{4}{7}}$

$x = 40.9 \quad x = 139.1$



$x = 40.9, 319.1$



$x = 139.1, 220.9$

$x = 40.9,\ 139.1,\ 220.9,\ 319.1$

9) a) $(2 + \tan\theta)(4\sin\theta - 1) = 0$

$2 + \tan\theta = 0$

$\tan\theta = -2$

$\theta = \tan^{-1}(-2)$

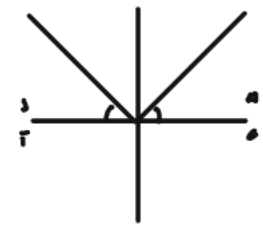
$\theta = -63.4$

$\theta = -63.4 + 180 = 116.6°$

$4\sin\theta - 1 = 0$

$\sin\theta = \frac{1}{4}$

$\theta = 14.5$



$\theta = 14.5,\ 165.5$

$\theta = 14.5,\ 166.6,\ 165.5$

b) $\frac{6\sin x}{\tan x} = 1$

$6\sin x = \tan x$

$6\sin x = \frac{\sin x}{\cos x}$

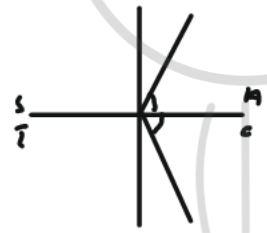
$6\sin x \cos x = \sin x$

$6\cos x = \frac{\sin x}{\sin x}$

$6\cos x = 1$

$\cos x = \frac{1}{6}$

$x = 80.4$



$x = 80.4,\ 279.6$