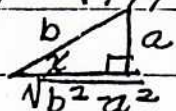


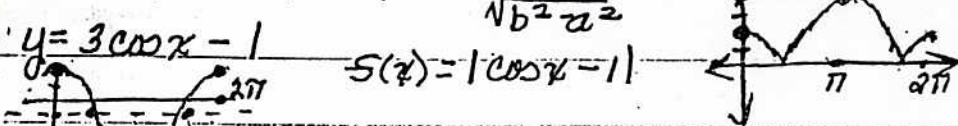
Trigonometry solutions : Alpha 2003

b 1. $-\frac{1100\pi}{7} = (-493.678 + 156\pi) = -3.5895 \therefore \Pi$

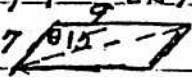
d 2. $x = -3 \cos \frac{2\pi}{3} = -3(-\frac{1}{2}) = \frac{3}{2}$ $y = -3 \sin \frac{2\pi}{3} = -3(\frac{\sqrt{3}}{2}) = \frac{-3\sqrt{3}}{2}$

c 3. $5 = 8$ $A = \sqrt{8(3)(3)(2)} = \sqrt{144} = 12$

a 4. $\sin(2x) = 2 \sin x \cos x$  $2(\frac{a}{b})(\frac{\sqrt{b^2 - a^2}}{b}) = \frac{2a\sqrt{b^2 - a^2}}{b^2}$

b 5. $y = 3 \cos x - 1$ $S(x) = |\cos x - 1|$ 

i) T, ii) T, iii) F, 0 ≤ S(x) ≤ 4, iv) T

c 6.  $\theta = \cos^{-1} \left[\frac{225 - 49 - 81}{-2(7)(9)} \right]$ $\theta = 139^\circ$ $\theta = 41^\circ$ smallest

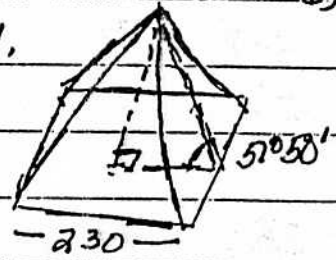
d 7. $\cos \theta \cos 30^\circ - \sin \theta \sin 30^\circ = \frac{\sqrt{3}}{2} \cos \theta - \frac{1}{2} \sin \theta$

c 8. i) $\frac{a}{c} - 1 = \frac{\sin A}{\sin C} - 1$ and iv) $1 + \frac{b}{c} = 1 + \frac{\sin B}{\sin C}$ and iii) reciprocal

d 9. $2 \left[\frac{10}{360} \cdot 2\pi(3.5) \right] = 1.221730476$ $1 \text{ hr} = 3600 \text{ SEC}$ $\therefore 1466.077$ 1200 complete swings

d 10. $2 \sin^2 x (1 - \cos x) + \sin x (1 - \cos x) = (2 \sin^2 x + \sin x)(1 - \cos x) =$
 $\sin x (2 \sin x + 1)(1 - \cos x)$ $\sin x = 0$ $0, \pi, 2\pi, 3\pi, 4\pi$ $\therefore \frac{10\pi + 10\pi}{20\pi}$
 $\sin x = -\frac{1}{2}$ $\frac{7\pi}{6}, \frac{11\pi}{6}, \frac{19\pi}{6}, \frac{23\pi}{6}$ $\cos x = 1$ $0, 2\pi, 4\pi$ already included

b 11.



$\cos 51^\circ 50' = \frac{125}{x}$
 $x = \frac{125}{\cos 51^\circ 50'} = 202.281$

b 12. $3x + \frac{\pi}{4} = \frac{\pi}{2}$ $3x = \frac{\pi}{4}$ $x = \frac{\pi}{12}$

d 13. $\cos^{-1}(\frac{1}{2}) \neq \cos^{-1}(-\frac{1}{2})$ $\frac{\pi}{3} \neq \frac{2\pi}{3}$

a 14. $\frac{\sin x}{\cos^2 x} \cdot \frac{1}{\sin x} = 2$ $\frac{1}{\cos^2 x} = 2$ $\sec x = \sqrt{2}$ $x = \frac{\pi}{3}$ $\ln(\frac{\pi}{3}) = .046$

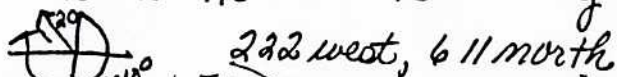
b 15. $\frac{\sqrt{\frac{1}{2}(1 - \cos(a+b))}}{\sqrt{\frac{1}{2}(1 - \cos a)}} = \frac{\sqrt{1 - (\cos a \cos b - \sin a \sin b)}}{\sqrt{1 - \cos a}} = \frac{\sqrt{1 - \cos a \cos b + \sin a \sin b}}{\sqrt{1 - \cos a}}$

c 16. $\tan(a+b) = \frac{\tan a + \tan b}{1 - \tan a \tan b} = \frac{P+Q}{1-PQ}$ $4(P+1)3(Q+1) = 24$
 $(P+1)(Q+1) = 2$
 $PQ + P + Q + 1 = 2$ $PQ = 1 - P - Q$
 $\frac{P+Q}{1 - (1 - P - Q)} = \frac{P+Q}{P+Q} = 1$ $\tan(a+b) = 1$ $a+b = \pi/4$

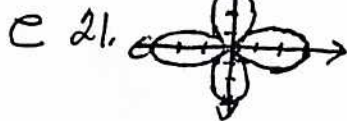
17. $\frac{\pi}{6}x - \frac{\pi}{2} = 0$ $x = 3$ The graph is shifted 3 units to the right.

d 18. $\frac{\cot A}{1} \cdot \frac{2 \tan A}{1 - \tan^2 A} = 3$ $\frac{2}{1 - \tan^2 A} = 3$ $2 = 3 - 3 \tan^2 A$ $-1 = -3 \tan^2 A$
 $\tan^2 A = \frac{1}{3}$ $\tan A = \pm \frac{1}{\sqrt{3}}$ $A = \frac{5\pi}{6}$ $\ln\left(\frac{5\pi}{6}\right) = .962$

b 19. $x = 1300 \cos 110^\circ = -445$ $y = 1300 \sin 110^\circ = 1222$



d 20. $\frac{1.5 \text{ rev}}{1 \text{ sec}} \cdot \frac{2\pi \text{ m}}{1 \text{ rev}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} = 180\pi$



b 22. X $12 \sin 64^\circ = h = 10.7855$ $a < h \therefore 0$

Y $22 \sin 47^\circ = h = 16.08978$ $a < h \therefore 0$

Z $3 \sin 30^\circ = h = 1.5$ $a > h \therefore 2$

a 23. $\tan B = \left(\frac{2}{3\sqrt{2}}\right)$ $\tan^{-1}\left(\frac{2}{3\sqrt{2}}\right) = 25.2$

c 24. $4 \sin^2 x + 12 \sin x \cos x + 9 \cos^2 x + 9 \sin^2 x - 12 \sin x \cos x + 4 \cos^2 x = A$

$4 \sin^2 x + 4 \cos^2 x + 9 \sin^2 x + 9 \cos^2 x = A$ $4(\sin^2 x + \cos^2 x) + 9(\sin^2 x + \cos^2 x) = A$

$13 = A$ $\ln 13 = 2.5649$

c 25. $80 = 40 + 60 \cos\left(\frac{\pi}{6}t\right)$ $40 = 60 \cos\left(\frac{\pi}{6}t\right)$ $\frac{2}{3} = \cos\left(\frac{\pi}{6}t\right)$

$\cos^{-1}\left(\frac{2}{3}\right) = \frac{\pi}{6}t$ $t = 1.606$ $\ln(1.606) = .4737$

d 26. Area of $R_1 = .5(62)(74) \sin(132) = 1704.774$

$S = \sqrt{62^2 + 74^2 - 2(62)(74) \cos(132)} = 124.33801$

$\frac{\sin \alpha}{74} = \frac{\sin 132}{124.33801}$ $\alpha = \sin^{-1}\left[\frac{74 \sin 132}{124.33801}\right] =$

$127 - 26.2497 = 100.7503$ Area of $R_2 = .5(45)(124.33801) \sin(100.7503) = 2748.505$

$R_1 + R_2 = 1704.774 + 2748.505 = 4453.2$

d 27. $y = \sin 2\left(x - \frac{\pi}{4}\right)$ $\sin 2\left(x - \frac{\pi}{4}\right) > 0$ $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right) \cup \left(\frac{5\pi}{4}, \frac{7\pi}{4}\right)$
 $\frac{16\pi}{4} = 4\pi$

a 28. $4x^2 + 3y^2 - 6y - 9 = 0$ $4(x^2 + y^2) = (y+3)^2$ $2r = r \cos \theta + 3$

$4x^2 + 3y^2 + y^2 = 6y + y^2 + 9$ $4r^2 = (r \cos \theta + 3)^2$ $2r - r \cos \theta = 3$

a 29. $\frac{\sin A}{12} = \frac{\sin 125}{20}$ $r(2 - \cos \theta) = 3$
 $r = \frac{3}{2 - \cos \theta}$

$A = \sin^{-1}\left[\frac{12 \sin 125}{20}\right] = 29.43864$

$C = 180 - 125 - 29.43864 = 25.56136$

$\sin 25.56136 = \frac{h}{12}$ $h = 5.1777$

b 28. $a = 5$ $\frac{2\pi}{45}$ $b = \frac{2\pi}{45}$ $c = \frac{2\pi}{45}$