Review Solutn

① (a) $-225°,\ 495°$ (b) $-\frac{5\pi}{4},\ \frac{11\pi}{4}$

② $69°25'37''$

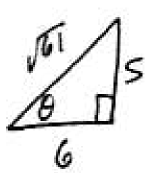
③ (a) $150° \cdot \frac{\pi}{180°} = \frac{5\pi}{6}$ (b) $225° \cdot \frac{\pi}{180°} = \frac{5\pi}{4}$.

④ (a) $\frac{7\pi}{6} \cdot \frac{180°}{\pi} = 210°$ (b) $-\frac{\pi}{3} \cdot \frac{180°}{\pi} = -60°$

⑤ $s = r\theta$ $r = 10,\ \theta = 120° \cdot \frac{\pi}{180°} = \frac{2\pi}{3}$.

$s = 10 \cdot \frac{2\pi}{3} = \frac{20\pi}{3}$.

⑥ $A = \frac{1}{2} r^2 \theta = \frac{1}{2}(10)^2\left(\frac{2\pi}{3}\right) = \frac{100\pi}{3}$.

⑦ 

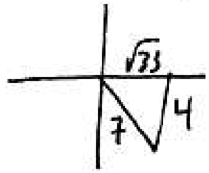
$\sin\theta = \frac{5}{\sqrt{61}}$, $\cos\theta = \frac{6}{\sqrt{61}}$, $\tan\theta = \frac{5}{6}$.

$\csc\theta = \frac{\sqrt{61}}{5}$, $\sec\theta = \frac{\sqrt{61}}{6}$, $\cot\theta = \frac{6}{5}$.

⑧ (a) $\sin 60° = \frac{\sqrt{3}}{2}$ (c) $\tan\left(-\frac{\pi}{4}\right) = -1$ (e) $\sec\frac{5\pi}{3} = \frac{1}{2}$.

(b) $\cos\left(\frac{\pi}{2}\right) = 0$ (d) $\csc(270°) = -1$ (f) $\cot\left(\frac{5\pi}{6}\right) = -\sqrt{3}$.

⑨ $\sin\alpha = \frac{-4}{7}$ α in qdrt IV.



$\sin\alpha = \frac{-4}{7}$, $\cos\alpha = \frac{\sqrt{33}}{7}$, $\tan\alpha = \frac{4}{\sqrt{33}}$

$\csc\alpha = \frac{-7}{4}$ $\sec\alpha = \frac{7}{\sqrt{33}}$, $\cot\alpha = \frac{\sqrt{33}}{4}$.

⑩

(10) ⓐ $3\sin\left(\frac{1}{2}x+\pi\right)$

Note: The Graph include the graph of fn (12c)

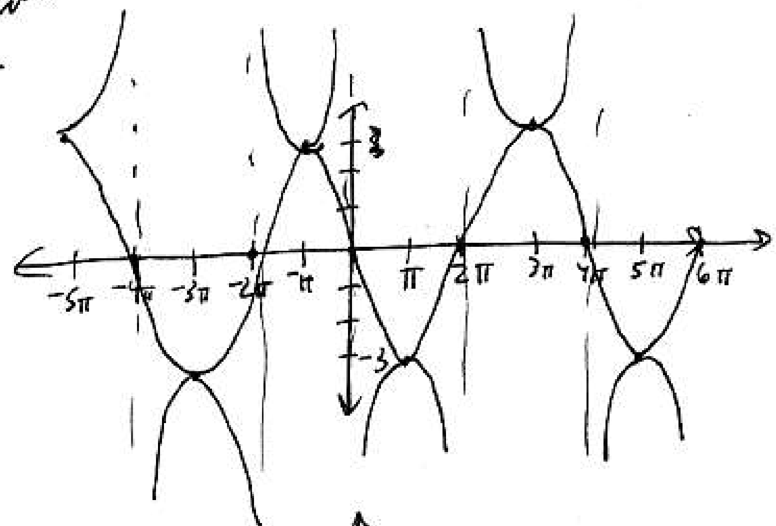
$a=3 \quad b=\frac{1}{2} \quad c=\pi$

Amplitude : 3

Period : $\dfrac{2\pi}{\frac{1}{2}} = 4\pi$

Location of one period $\quad 0 \le \frac{1}{2}x+\pi \le 2\pi$

$$-\pi \le \tfrac{1}{2}x \le \pi$$
$$-2\pi \le x \le 2\pi$$



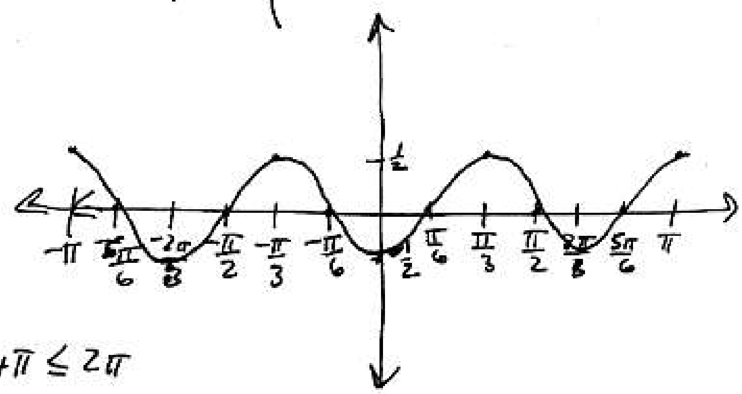
(10) ⓑ $\frac{1}{2}\cos(3x+\pi)$

Amplitude : $\frac{1}{2}$

Period : $\frac{2\pi}{3}$.

Location of one period $\quad 0 \le 3x+\pi \le 2\pi$

$$-\pi \le 3x \le \pi$$
$$-\frac{\pi}{3} \le x \le \frac{\pi}{3}$$



(11) $(-1,5) \xrightarrow[H]{} (-2,5) \xrightarrow[S]{} (-6,10) \xrightarrow[R]{} (-6,-10) \xrightarrow[V]{} (-6,-14)$

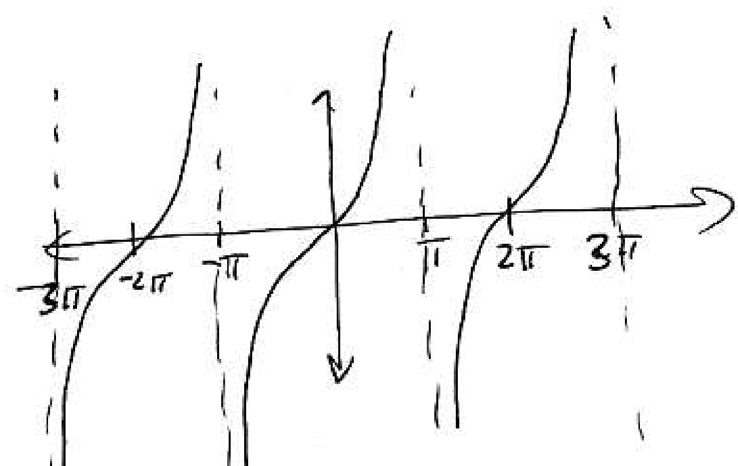
(12)

ⓐ $3\tan\left(\frac{1}{2}x\right)$

Period $\dfrac{\pi}{\frac{1}{2}} = 2\pi$.

One period

$$-\frac{\pi}{2} \le \tfrac{1}{2}x \le \frac{\pi}{2}$$
$$-\pi \le x \le \pi$$



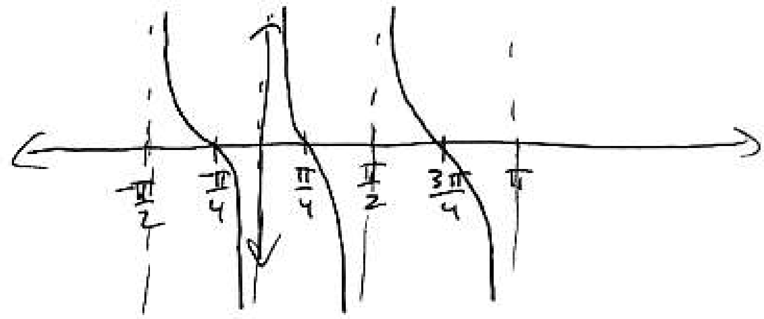
(b) $\cot(2x)$

Period $\frac{\pi}{2}$

Location of one period

$0 \le 2x \le \pi$

$0 \le x \le \frac{\pi}{2}$



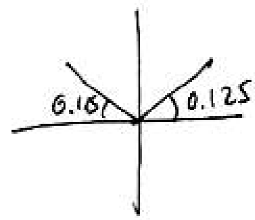
(c) $3\csc\left(\frac{1}{2}x+\pi\right)$ See 10a.

(13) Find angles in $[0,2\pi)$

(a) $\sin\theta = 0.1247$

$\theta = \sin^{-1}(0.1247) = 0.125$

$\pi - 0.125 \approx 3.017$

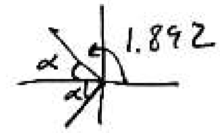


(b) $\cos\theta = -0.316$

$\theta = \cos^{-1}(-0.316) \approx \boxed{1.892}$

$\alpha = \pi - 1.892 \approx 1.25$

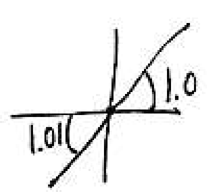
$\pi + \alpha = \boxed{4.391}$



(c) $\tan\theta = 1.58$

$\theta = \tan^{-1}(1.58) \approx \boxed{1.01}$

$\pi + 1.01 \approx \boxed{4.15}$



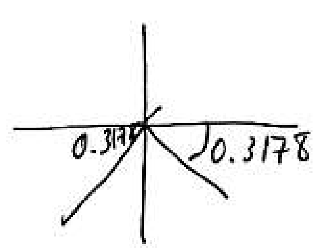
(d) $\csc\theta = -3.2$

$\frac{1}{\sin\theta} = -3.2$

$\sin\theta = \frac{1}{-3.2}$

$\theta = \sin^{-1}\left(\frac{-1}{3.2}\right)$

$\theta \approx -0.3178$

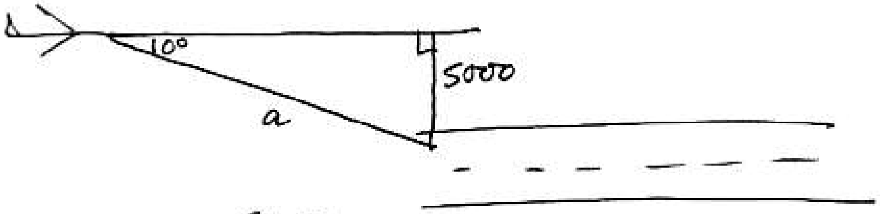


$2\pi - 0.3178 \approx \boxed{5.9654}$

$\pi + 0.3178 \approx \boxed{3.4594}$

Section 6.7

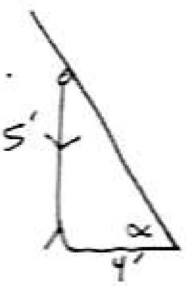
(27)



$$\sin 10^\circ = \frac{5000}{a}$$

$$a = \frac{5000}{\sin 10^\circ} \approx 28{,}800 \text{ ft.}$$

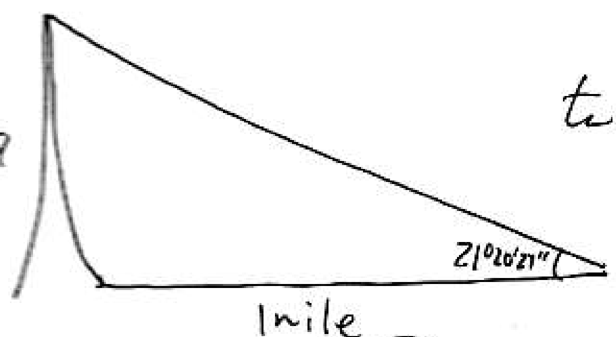
(35)



$$\tan\alpha = \frac{5}{4}$$

$$\alpha = \tan^{-1}\left(\frac{5}{4}\right) \approx 51.3^\circ.$$

(39)

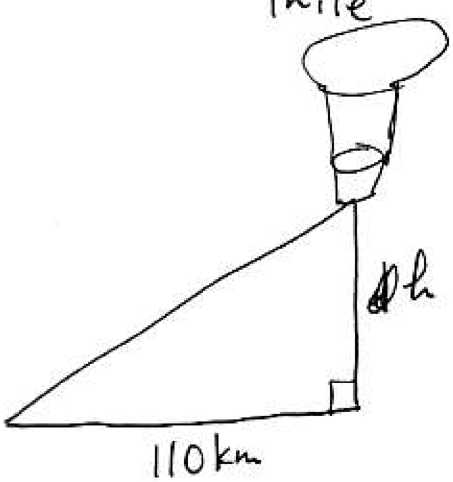


$$\tan 21^\circ 20' 24'' = \frac{a}{5280}$$

$$a = 5280 \tan 21^\circ 20' 24''$$

$$a \approx 2063 \text{ ft.}$$

(47)



$$\tan(19^\circ 20') = \frac{h}{110}$$

$$110 \tan(19^\circ 20') = h$$

$$38.6\text{km} = h$$

$$\tan(31^\circ 50') = \frac{h}{110}$$

$$110 \tan(31^\circ 50') = h$$

$$68.3\text{km} = h$$

$$68.3 - 38.6 = 29.7 \text{ km.}$$

(15) (a) $\cos^2\theta - \sin^2\theta = 2\cos^2\theta - 1$

$$\cos^2\theta - \sin^2\theta = \cos^2\theta - (\cancel{\cos} 1 - \cos^2\theta)$$
$$= \cos^2\theta - 1 + \cos^2\theta$$
$$= 2\cos^2\theta - 1.$$

(b) $\sin\theta \sec\theta = \tan\theta$

$$\sin\theta \sec\theta = \sin\theta \cdot \frac{1}{\cos\theta}$$
$$= \frac{\sin\theta}{\cos\theta}$$
$$= \tan\theta.$$

(c) $\dfrac{\sin\theta + \cos\theta}{\cos\theta} = 1 + \tan\theta$

$$\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\cos\theta} = \tan\theta + 1$$
$$= 1 + \tan\theta.$$

(d) $\dfrac{\cot(-x)}{\csc(-x)} = \cos x$

$$\frac{\dfrac{\cos(-x)}{\sin(-x)}}{\dfrac{1}{\sin(-x)}} = \frac{\cos(-x)}{\cancel{\sin(-x)}} \cdot \frac{\cancel{\sin(-x)}}{1}$$
$$= \cos(-x)$$
$$= \cos(x).$$

(e) $(\sec t + \tan t)^2 = \dfrac{1+\sin t}{1-\sin t}.$

$$(\sec t + \tan t)^2 = \left(\frac{1}{\cos t} + \frac{\sin t}{\cos t}\right)^2$$
$$= \frac{1}{\cos^2 t} + 2\cdot\frac{\sin t}{\cos^2 t} + \frac{\sin^2 t}{\cos^2 t}$$
$$= \frac{1 + 2\sin t + \sin^2 t}{\cos^2 t} = \frac{(1+\sin t)^2}{1-\sin^2 t} = \frac{(1+\sin t)^{\cancel{2}}}{\cancel{(1+\sin t)}(1-\sin t)}$$
$$= \frac{1+\sin t}{1-\sin t}.$$

(f) $\dfrac{1+\cos t}{\sin t} + \dfrac{\sin t}{1+\cos t} = 2\csc t$

$$\frac{1+\cos t}{\sin t} + \frac{\sin t}{1+\cos t} = \frac{(1+\cos t)}{(1+\cos t)}\cdot\frac{(1+\cos t)}{\sin t} + \frac{\sin t}{(1+\cos t)}\cdot\frac{\sin t}{\sin t}$$

$$= \frac{1+2\cos t+\cos^2 t+\sin^2 t}{\sin t\,(1+\cos t)}$$

$$= \frac{1+2\cos t+1}{\sin t\,(1+\cos t)}$$

$$= \frac{2+2\cos t}{\sin t\,(1+\cos t)}$$

$$= \frac{2\cancel{(1+\cos t)}}{\sin t\,\cancel{(1+\cos t)}}$$

$$= 2\csc t.$$

(g) $\sin\left(\theta - \frac{3\pi}{2}\right) = \sin\theta\cos\frac{3\pi}{2} - \cos\theta\sin\frac{3\pi}{2}$

$= \sin\theta\cdot 0 - \cos\theta\cdot(-1)$

$= \cos\theta$

(h) $\cos\left(\theta - \frac{5\pi}{2}\right) = \cos\theta\cos\frac{5\pi}{2} + \sin\theta\sin\frac{5\pi}{2}$

$= \cos\theta\cdot 0 + \sin\theta\cdot 1$

$= \sin\theta$

(i) $(\sin t+\cos t)^2 = 1+\sin(2t)$

$(\sin t+\cos t)^2 = \sin^2 t + 2\sin t\cos t + \cos^2 t$

$= 1 + 2\sin t\cos t$

$= 1+\sin 2t.$

(7) $\csc(2u) = \frac{1}{2}\csc u \sec u$

$$\csc(2u) = \frac{1}{\sin(2u)}$$
$$= \frac{1}{2\sin(u)\cos u}$$
$$= \frac{1}{2}\csc u \sec u.$$

(16) (a) $\sec\alpha = 2$

$\alpha = \frac{\pi}{3} + 2\pi n$ or $\frac{5\pi}{3} + 2\pi n$

for all integer n

(b) $2\cos\theta - \sqrt{2} = 0$

$\cos\theta = \frac{\sqrt{2}}{2}.$

$\theta = \frac{\pi}{4} + 2\pi n$ or $\frac{7\pi}{4} + 2\pi n$

for any integer n.

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

$2x = \frac{2\pi}{3} + 2\pi n$ & $2x = \frac{4\pi}{3} + 2\pi n$

$x = \frac{\pi}{3} + \pi n$ & $x = \frac{2\pi}{3} + \pi n.$

for any integer n

(d) $2\sin^2 u - 3\sin u - 2 = 0$

$(2\sin u + 1)(\sin u - 2) = 0$

$\sin u = -\frac{1}{2}$ $\quad$ $\sin u = 2$

$u = -\frac{\pi}{6} + 2\pi n$ or $\quad$ No Solution

$\frac{7\pi}{6} + 2\pi n$ for any integer n.

(17) (a) $\cot^2\theta - \cot\theta = 0$

$\cot\theta(\cot\theta - 1) = 0$

$\cot\theta = 0$ or $\cot\theta = 1$

$\theta = \frac{\pi}{2}$ or $\frac{3\pi}{2}$ $\quad$ $\theta = \frac{\pi}{4}$ or $\frac{5\pi}{4}$

(b) $\sin^2\theta + \sin\theta - 6 = 0$

$(\sin\theta + 3)(\sin\theta - 2) = 0$

$\sin\theta = -3$ or $\sin\theta = 2$

No Solution.

(c) $3\cos^2\theta - 3\cos\theta - 1 = 0$

$$\cos\theta = \frac{3 \pm \sqrt{9-4(3)(-1)}}{2(3)} = \frac{3 \pm \sqrt{21}}{6}$$

$\cos\theta = 1.26$ or $\cos\theta = -0.2638$

No Soln $\quad \theta = 1.8377$ or 4.445.

(18) (a) $\sin\left(\frac{5\pi}{12}\right) = \sin\left(\frac{\pi}{4}\right)\cos\left(\frac{\pi}{6}\right) + \cos\left(\frac{\pi}{4}\right)\sin\left(\frac{\pi}{6}\right)$

$= \frac{\sqrt{2}}{2}\cdot\frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2}\cdot\frac{1}{2} = \frac{\sqrt{6}+\sqrt{2}}{4}$.

(b) $\cos\left(\frac{5\pi}{12}\right) = \cos\left(\frac{\pi}{4}\right)\cos\left(\frac{\pi}{6}\right) - \sin\left(\frac{\pi}{4}\right)\sin\left(\frac{\pi}{6}\right)$

$= \frac{\sqrt{2}}{2}\cdot\frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2}\cdot\frac{1}{2} = \frac{\sqrt{6}-\sqrt{2}}{4}$.

(19) $\csc\alpha = \frac{13}{12} \qquad \cot\beta = \frac{4}{3}$

$\sin\alpha = \frac{12}{13} \qquad \sin\beta = \frac{3}{5}$

$\cos\alpha = \frac{5}{13} \qquad \cos\beta = \frac{4}{5}$

$\tan\alpha = \frac{12}{5} \qquad \tan\beta = \frac{3}{4}$

(a) $\sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$

$= \frac{12}{13}\cdot\frac{4}{5} + \frac{5}{13}\cdot\frac{3}{5}$

$= \frac{48+15}{65} = \frac{63}{65}$

(b) $\tan(\alpha+\beta) = \frac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$

$= \frac{\frac{12}{5}+\frac{3}{4}}{1-\frac{12}{5}\cdot\frac{3}{4}}\cdot\frac{20}{20}$

$= \frac{48+15}{20-36} = \frac{63}{-16}$.

(c) $\alpha+\beta$ is in quadrant II.

(20) (a) $\sin(32^\circ)\cos(12^\circ) - \cos(32^\circ)\sin(12^\circ)$

$\sin(32^\circ - 12^\circ) = \sin(20^\circ)$.

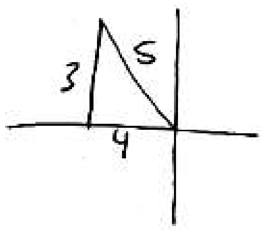
(b) $\cos(15^\circ)\cos(82^\circ) - \sin(15^\circ)\sin(82^\circ)$

$\cos(15^\circ + 82^\circ) = \cos(97^\circ)$.

(21) $\tan\alpha = -\frac{3}{4}$

$\sin\alpha = \frac{3}{5}$

$\cos\alpha = \frac{-4}{5}$



(a) $\sin 2\alpha = 2\sin\alpha\cos\alpha$
$= 2\left(\frac{3}{5}\right)\left(-\frac{4}{5}\right) = \frac{-24}{25}$

(b) $\cos(2\alpha) = \cos^2\alpha - \sin^2\alpha$
$= \left(\frac{-4}{5}\right)^2 - \left(\frac{3}{5}\right)^2$
$= \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$.

(c) $\tan 2\alpha = \frac{2\tan\alpha}{1-\tan^2\alpha} = \frac{2\cdot\left(\frac{-3}{4}\right)}{1-\left(\frac{-3}{4}\right)^2} = \frac{\frac{-8}{4}}{1-\frac{9}{16}}\cdot\frac{16}{16} = \frac{-32}{16-9} = \frac{-32}{7}$.

(d) $\cancel{\sin\frac{\alpha}{2} = \sqrt{\ }}$

Since α is in quadrant II, $\frac{\alpha}{2}$ is in quadrant I.

$\sin\frac{\alpha}{2} = \sqrt{\frac{1-\cos\alpha}{2}} = \sqrt{\frac{1-\left(-\frac{4}{5}\right)}{2}\cdot\frac{5}{5}} = \sqrt{\frac{5+4}{10}} = \sqrt{\frac{9}{10}} = \frac{3\sqrt{10}}{10}$.

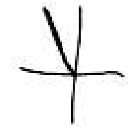
(e) $\cos\frac{\alpha}{2} = \sqrt{\frac{1+\cos\alpha}{2}} = \sqrt{\frac{1+\frac{-4}{5}}{2}\cdot\frac{5}{5}} = \sqrt{\frac{5-4}{10}} = \sqrt{\frac{1}{10}} = \frac{\sqrt{10}}{10}$.

(f) $\tan\frac{\alpha}{2} = \frac{1-\cos\alpha}{\sin\alpha} = \frac{1-\left(-\frac{4}{5}\right)}{\frac{3}{5}}\cdot\frac{5}{5} = \frac{5+4}{3} = \frac{9}{3} = 3$.

22 (a) $\cos\left(\frac{\pi}{8}\right) = \cos\left(\frac{\pi/4}{2}\right) = \sqrt{\frac{1+\cos\frac{\pi}{4}}{2}}$

$= \sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}\cdot\frac{2}{2}}$

$= \sqrt{\frac{2+\sqrt{2}}{4}} = \frac{\sqrt{2+\sqrt{2}}}{2}$.



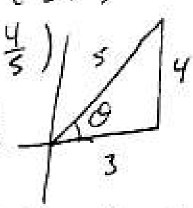
(b) $\sin(72.5^\circ) = \sin\left(\frac{135^\circ}{2}\right) = \sqrt{\frac{1-\cos 135^\circ}{2}} = \sqrt{\frac{1-\frac{\sqrt{2}}{2}}{2}\cdot\frac{2}{2}} = \frac{\sqrt{2-\sqrt{2}}}{2}$.

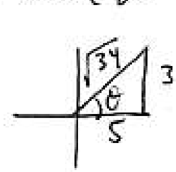
23 (a) $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right) = \frac{3\pi}{4}$ (b) $\arcsin\left(-\frac{\sqrt{2}}{2}\right) = -\frac{\pi}{4}$ (c) $\cos\left(\cos^{-1}\left(\frac{2}{3}\right)\right) = \frac{2}{3}$

(d) $\tan\left(\sin^{-1}\left(\frac{4}{5}\right)\right)$ (e) $\arccos\left(\frac{\pi}{2}\right)$ DNE. $\frac{\pi}{2} > 1$ (f) $\sec\left(\tan^{-1}\left(\frac{3}{5}\right)\right)$

Let $\theta = \sin^{-1}\left(\frac{4}{5}\right)$

$\sin\theta = \frac{4}{5}$



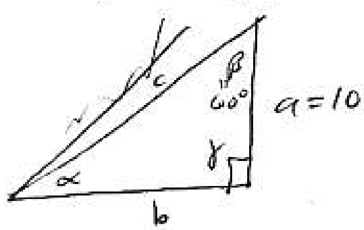


$\sec\theta = \frac{\sqrt{34}}{5}$.

$\tan\left(\sin^{-1}\left(\frac{4}{5}\right)\right) = \tan\theta = \frac{4}{3}$

(g) $\sin^{-1}\left(\sin\left(\frac{\pi}{8}\right)\right) = \frac{\pi}{8}$ (h) $\cos^{-1}\left(\cos\left(\frac{5\pi}{4}\right)\right) = \cos^{-1}\left(-\frac{\sqrt{2}}{2}\right) = \frac{3\pi}{4}$.

24 (a) $\gamma = 90^\circ,\ a = 10,\ \beta = 60^\circ$



$\boxed{\alpha = 90^\circ - 60^\circ = 30^\circ}$

(b) $\tan 30^\circ = \frac{10}{b}$

$\frac{\sqrt{3}}{3} = \frac{10}{b}$

$\boxed{b = 10\sqrt{3}}$

$c^2 = a^2 + b^2$

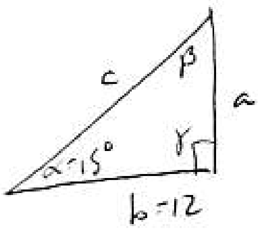
$c^2 = 10^2 + (10\sqrt{3})^2$

$c^2 = 100 + 300$

$c^2 = 400$

$\boxed{c = 20}$.

(b) $\gamma = 90°, b = 12, \alpha = 15°$



$\boxed{\beta = 90° - 15° = 75°}$

$\tan 15° = \frac{a}{12}$

$12 \tan 15° = a$

$\boxed{3.2 = a}$

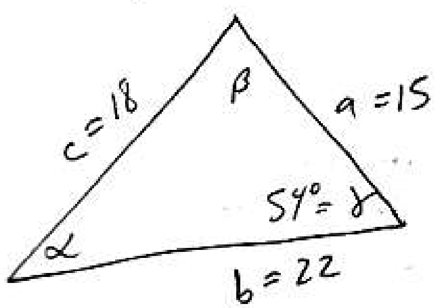
$c^2 = a^2 + b^2$

$c^2 = 3^2 + 12^2$

$c^2 = 153$

$\boxed{c = 12.4}$

(c) $a = 15, b = 22, c = 18$



$c^2 = a^2 + b^2 - 2ab \cos\gamma$

$18^2 = 15^2 + 22^2 - 2(15)(22) \cos\gamma$

$-385 = -660 \cos\gamma$

$0.583 = \cos\gamma$

$\boxed{54° \approx \gamma}$

$\frac{\sin 54°}{18} = \frac{\sin\alpha}{15}$

$0.6742 = \sin\alpha$

$\boxed{77° = \alpha}$

$\beta = 180° - 54° - 77° = 49°$

(d) ~~$\alpha = 13°, b = 10, a = 15$~~ ~~$\alpha_1 = 20°$~~ ~~$\alpha_2 = 160°$~~

~~$\frac{\sin\beta}{b} = \frac{\sin\alpha}{a}$~~

~~$\frac{\sin 13°}{10} = \frac{\sin\alpha}{15}$~~

~~$0.3374 = \sin\alpha$~~

~~$20° = \alpha$~~

~~$\alpha_2\ \alpha = 160°$~~

(d) $\alpha = 13°$, $b = 10$, $a = 15$.

$$\frac{\sin\alpha}{a} = \frac{\sin\beta}{b}$$

$$\frac{\sin 13°}{15} = \frac{\sin\beta}{10}$$

$$0.15 = \sin\beta$$

$$\boxed{9° = \beta}$$

or $\beta = 171°$. ← Too big.

$$\boxed{\gamma = 180° - 13° - 9° = 158°}$$

$$\frac{\sin\gamma}{c} = \frac{\sin\beta}{b}$$

$$\frac{\sin 158°}{c} = \frac{\sin 9°}{10}$$

$$\frac{10\sin 158°}{\sin 9°} = c$$

$$24 = c$$

(e) $\alpha = 23°$, $a = 19$, $c = 51$

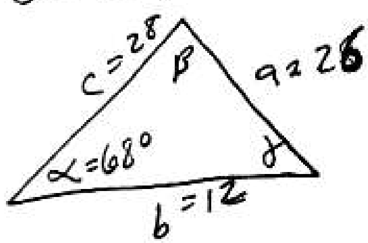
$$\frac{\sin\alpha}{a} = \frac{\sin\gamma}{c}$$

$$\frac{\sin 23°}{19} = \frac{\sin\gamma}{51}$$

$$1.05 = \sin\gamma$$

No Triangle Exists

(f) $b = 12$, $\alpha = 68°$, $c = 28$



$$a^2 = b^2 + c^2 - 2bc\cos\alpha$$

$$a^2 = 12^2 + 28^2 - 2(12)(28)\cos 68°$$

$$a^2 = 676.264$$

$$\boxed{a \approx 26}$$

$$\frac{\sin\alpha}{a} = \frac{\sin\beta}{b}$$

$$\frac{\sin 68°}{26} = \frac{\sin\beta}{12}$$

$$0.428 = \sin\beta$$

$$\boxed{25° = \beta}$$

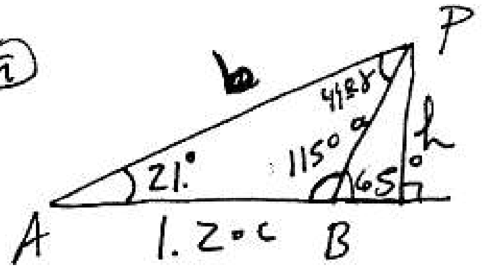
$$\gamma = 180° - 68° - 25°$$

$$\boxed{\gamma = 87°}$$

25 Section 8.1

19

a



$$\boxed{\gamma = 180^\circ - 21^\circ - 115^\circ = 44^\circ}$$

$$\frac{\sin \gamma}{c} = \frac{\sin 115^\circ}{b}$$

$$\frac{\sin 44^\circ}{1.2} = \frac{\sin 115^\circ}{b}$$

$$b = \frac{1.2 \sin 115^\circ}{\sin 44^\circ}$$

$$b = 1.6 \text{ miles}$$

b

$$\frac{\sin 21^\circ}{a} = \frac{\sin 44^\circ}{1.2}$$

$$\frac{1.2 \sin 21^\circ}{\sin 44^\circ} = a$$

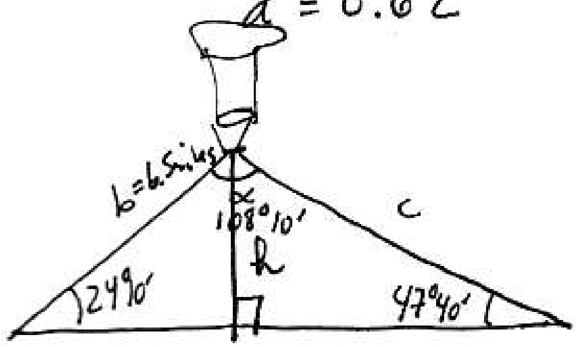
$$a = 0.62$$

$$\sin 65^\circ = \frac{h}{0.62}$$

$$0.62 \sin 65^\circ = h$$

$$0.56 \text{ miles} = h$$

21



$$\alpha = 180^\circ - 24^\circ 10' - 47^\circ 40'$$

$$\alpha = 108^\circ 10'$$

$$8.4 = a$$

$$\frac{\sin(108^\circ 10')}{8.4} = \frac{\sin 47^\circ 40'}{b}$$

$$b = \frac{8.4 \sin(47^\circ 40')}{\sin(108^\circ 10')}$$

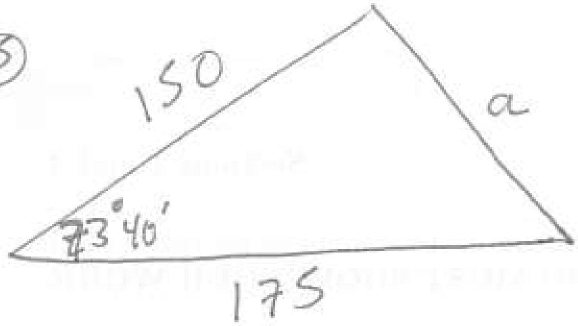
$$b \approx 6.5 \text{ miles}$$

$$h = 6.5 \sin(24^\circ 10')$$

$$\boxed{h \approx 2.7 \text{ miles}}$$

26

13

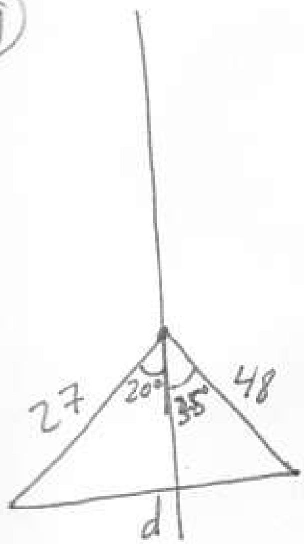


$a^2 = 150^2 + 175^2 - 2(150)(175)\cos(73°40')$

$a^2 = 38360.7$

$a \approx \cancel{466}\ 196$ feet.

19

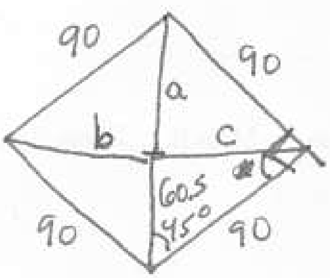


$d^2 = 27^2 + 48^2 - 2(27)(48)\cos(55°)$

$d^2 \doteq 1546.3$

$d \approx 39$ miles

25



$a + 60.5 = 90\sqrt{2}$

$a + 60.5 = 127.3$

$a \approx 66.8$ ft to 2nd base

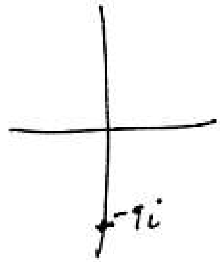
$c^2 \doteq 60.5^2 + 90^2 - 2(60.5)(90)\cos 45°$

$c^2 = 4059.9$

$c \approx 63.7$ ft. to first and third.

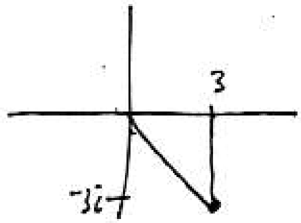
(27)

(a) $-9i$



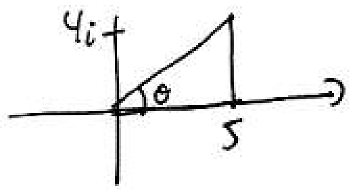
$$9\left(\cos\frac{3\pi}{2} + i\sin\left(\frac{3\pi}{2}\right)\right)$$

(b) $3-3i$



$$3\sqrt{2}\left(\cos\left(-\frac{\pi}{4}\right) + i\sin\left(-\frac{\pi}{4}\right)\right)$$

(c) $5+4i$



$\theta = \arctan\left(\frac{4}{5}\right).$

$|z| = \sqrt{41}$

$$\sqrt{41}\left(\cos\left(\arctan\left(\frac{4}{5}\right)\right) + i\sin\left(\arctan\left(\frac{4}{5}\right)\right)\right)$$

(28) (a) $8\left(\frac{\sqrt{2}}{2} + i\left(-\frac{\sqrt{2}}{2}\right)\right)$

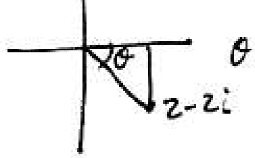
$4\sqrt{2} - 4\sqrt{2}\,i$

(b) $10\left(\cos\left(\arctan\left(\frac{2}{3}\right)\right) + i\sin\left(\arctan\left(\frac{2}{3}\right)\right)\right)$

$10\left(\frac{3}{\sqrt{13}} + i\,\frac{2}{\sqrt{13}}\right)$

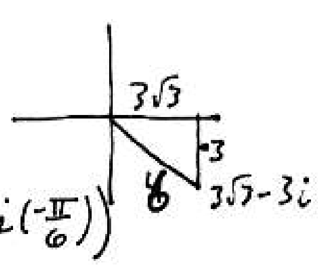
$\frac{30\sqrt{13}}{13} + \frac{20\sqrt{13}}{13}\,i$

(29) $z_1 = 2-2i$



$\theta = -\frac{\pi}{4}$ $\quad z_1 = 2\sqrt{2}\left(\cos\left(-\frac{\pi}{4}\right) + i\sin\left(-\frac{\pi}{4}\right)\right)$

$z_2 = 3\sqrt{3} - 3i$



$$|z_2| = \sqrt{(3\sqrt{3})^2 + 3^2} = \sqrt{27+9} = \sqrt{36} = 6$$

$$z_2 = 6\left(\cos\left(-\frac{\pi}{6}\right) + i\sin\left(-\frac{\pi}{6}\right)\right)$$

$$z_1 \cdot z_2 = 8\sqrt{2}\left(\cos\left(-\frac{\pi}{4} + -\frac{\pi}{6}\right) + i\sin\left(-\frac{\pi}{4} + -\frac{\pi}{6}\right)\right)$$
$$= 8\sqrt{2}\left(\cos\left(-\frac{5\pi}{12}\right) + i\sin\left(-\frac{5\pi}{12}\right)\right)$$

$$\frac{z_1}{z_2} = \frac{\sqrt{2}}{2}\left(\cos\left(-\frac{\pi}{4} - \left(-\frac{\pi}{6}\right)\right) + i\sin\left(-\frac{\pi}{4} - \left(-\frac{\pi}{6}\right)\right)\right)$$
$$= \frac{\sqrt{2}}{2}\left(\cos\left(-\frac{\pi}{12}\right) + i\sin\left(-\frac{\pi}{12}\right)\right)$$

30 a $$z_1^{10} = (2\sqrt{2})^{10}\left(\cos\left(10 \cdot -\frac{\pi}{4}\right) + i\sin\left(10 \cdot -\frac{\pi}{4}\right)\right)$$
$$= 32768\left(\cos\left(-\frac{5\pi}{2}\right) + i\sin\left(-\frac{5\pi}{2}\right)\right)$$
$$= 32768\left(0 + i(-1)\right)$$
$$= -32768i$$

b $$z_2^6 = 46656\left(\cos\left(6 \cdot -\frac{\pi}{6}\right) + i\sin\left(6 \cdot -\frac{\pi}{6}\right)\right)$$
$$= 46656\left(\cos(-\pi) + i\sin(-\pi)\right)$$
$$= -46656.$$