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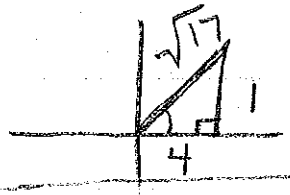
1. $\cot\theta = 4 \quad \cos\theta > 0$

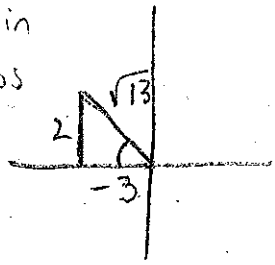
$\frac{\cos}{\sin} = \frac{4}{1}$



$\boxed{\sin\theta = \frac{1}{\sqrt{17}}} \qquad \boxed{\cos\theta = \frac{4}{\sqrt{17}}}$

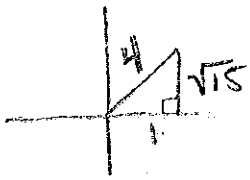
2. $\tan\theta = \frac{-2}{3} \quad \frac{\sin}{\cos} \quad \frac{2}{-3}$

$\frac{1}{\sin} \quad \csc\theta > 0$



$\boxed{\sec\theta = \frac{-\sqrt{13}}{3} \quad \sin\theta = \frac{2}{\sqrt{13}}}$

3. $\cos\theta = \frac{1}{4} \quad \sin > 0$



$\boxed{\tan\theta = \sqrt{15} \qquad \csc\theta = \frac{4}{\sqrt{15}}}$

4. $\frac{\sin(-x)}{\tan(-x)}$ odd / odd

$= \frac{-\sin x}{-\tan x}$

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

$= \frac{\sin}{1} \cdot \frac{\cos}{\sin}$

$\boxed{= \cos x}$

5. $\frac{\sec^2 x}{\cot^2 x + 1}$

$= \frac{\sec^2 x}{\csc^2 x}$

$= \frac{\frac{1}{\cos^2 x}}{\frac{1}{\sin^2 x}}$

$= \frac{1}{\cos^2 x} \cdot \frac{\sin^2 x}{1}$

$= \frac{\sin^2 x}{\cos^2 x} = \boxed{\tan^2 x}$

$\sin\left(\frac{\pi}{2} - x\right)$

6. $\frac{\sin(90° - x)}{\cot^2(90° - x) + 1}$

$= \frac{\cos x}{\tan^2 x + 1}$

$= \frac{\cos x}{\sec^2 x}$

$= \frac{\cos x}{\frac{1}{\cos^2 x}}$

$= \frac{\cos x}{1} \cdot \frac{\cos^2 x}{1}$

$= \cos^3 x$

7. $\frac{\sin x}{1 + \sec x} \quad \frac{(-\sec x)}{(1 - \sec x)}$

$= \frac{\sin x(1 - \sec x)}{1 - \sec^2 x}$

$= \frac{\sin x(1 - \sec x)}{-\tan^2 x}$

$= \frac{\sin x(1 - \sec x)}{-\frac{\sin^2}{\cos^2}}$

$= \sin x(1 - \sec x) \cdot \frac{(-\cos^2)}{\sin^2}$

$= \frac{-\cos^2 x(1 - \sec x)}{\sin x}$

$= \frac{-\cos^2 x + \cos^2 \sec x}{\sin}$

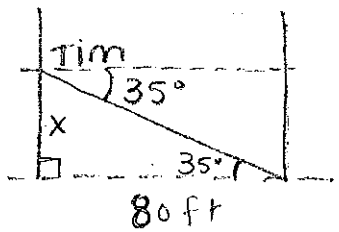
$= -\cos \cdot \frac{\cos}{\sin} + \frac{\cos^2 \cdot \frac{1}{\cos}}{\sin}$

$= -\cos x \cot + \frac{\cos}{\sin}$

$= -\cos x \cot y + \cot x$

8. a. $\cos\theta' = \cos(90° - \theta)$
$\sin\theta = \cos(90° - \theta)$
$\sin\theta = \cos\theta'$

b.



$\tan 35° = \frac{x}{80}$

$x = 80 \tan 35°$ $\quad x = 56.02$ ft

9. D

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$$\frac{\cos\theta}{(1-\sin\theta)(1+\sin\theta)} - \frac{\cos\theta}{(1-\sin\theta)(1+\sin\theta)} = -2\tan\theta \quad \checkmark$$

$$\frac{\cos\theta - \sin\theta\cos\theta - \cos\theta - \sin\theta\cos\theta}{1-\sin^2\theta}$$

$$\frac{-2\sin\theta\cos\theta}{\cos^2\theta} =$$

$$\frac{-2\sin\theta}{\cos\theta} = -2\tan\theta \quad \checkmark$$

11. $\csc^2\theta - \sin^2\theta - \cos^2\theta - \cot^2\theta = 0 \quad \checkmark$

$$\frac{1}{\sin^2} - \sin^2\theta - \cos^2\theta - \frac{\cos^2\theta}{\sin^2} = 0$$

$$\frac{1-\cos^2\theta}{\sin^2\theta} - 1(\sin^2\theta + \cos^2\theta)$$

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

$$1 - 1 = 0 \quad \checkmark$$

12. $\sin\theta + \frac{\cos\theta}{\tan\theta} = \csc\theta$ ✓

$$\sin\theta + \frac{\cos\theta}{\frac{\sin\theta}{\cos\theta}}$$

$$= \sin\theta + \cos\theta \cdot \frac{\cos\theta}{\sin\theta}$$

$$\frac{\sin}{\sin}\cdot\frac{\sin}{1} + \frac{\cos^2}{\sin\theta} = \frac{\sin^2\theta + \cos^2\theta}{\sin}$$

$$= \frac{1}{\sin\theta} = \csc\theta \checkmark$$

13. $\frac{\cos\theta}{(1-\sin\theta)} \frac{(1-\sin\theta)}{1+\sin\theta} = \sec\theta - \tan\theta$ ✓

$$\frac{\cos\theta - \cos\theta\sin\theta}{1-\sin^2\theta} = \frac{\cos\cdot(1-\sin)}{\cos^2}$$

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

$$= \sec\theta - \tan\theta \checkmark$$

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14. $\frac{\csc\theta}{\sin\theta} + \frac{\cot\theta}{\cos\theta} = \cot^2\theta + \csc\theta + 1$ ✓

$\frac{\frac{1}{\sin}}{\sin} + \frac{\frac{\cos}{\sin}}{\cos} = \frac{1}{\sin}\cdot\frac{1}{\sin} + \frac{\cos}{\sin}\cdot\frac{1}{\cos}$

$= \frac{1}{\sin^2\theta} + \frac{1}{\sin\theta}$

$= \csc^2\theta + \csc\theta$ ✓

$= 1 + \cot^2\theta + \csc\theta = \cot^2\theta + \csc\theta + 1$

15. $\frac{1+\sin\theta}{\sin\theta} + \frac{\sin\theta}{(1-\sin\theta)\sin} = \frac{\csc\theta}{1-\sin\theta}$ ✓

(1−sin) (1−sin)

$\frac{1-\sin^2\theta + \sin^2\theta}{\sin\theta(1-\sin\theta)} = \frac{1}{\sin\theta(1-\sin\theta)}$

$= \frac{\csc\theta}{1-\sin\theta}$ ✓

Solve.

16. $4\sec\theta + 2\sqrt{3} = \sec\theta$

$-\sec\theta \quad\quad -\sec\theta$

$3\sec\theta + 2\sqrt{3} = 0$

$\frac{3\sec\theta}{3} = -\frac{2\sqrt{3}}{3}$

$\sec\theta = -\frac{2\sqrt{3}}{3}$

$\boxed{\theta = \frac{5\pi}{6}, \frac{7\pi}{6}}$

look for where $\cos\theta = -\frac{\sqrt{3}}{2}$

$\sec = \frac{1}{\cos}$

$= \frac{1}{-\frac{\sqrt{3}}{2}}$

$= \frac{-2}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}$

$= -\frac{2\sqrt{3}}{3}$

17. $2\tan\theta + 4 = \tan\theta + 5$

$-\tan\theta \quad -4 \quad -\tan\theta \quad -4$

$\tan\theta = 1$

$\boxed{\theta = \frac{\pi}{4}, \frac{5\pi}{4}}$

18. $4\cos^2\theta + 2 = 3$

$-2 \quad -2$

$\frac{4\cos^2\theta}{4} = \frac{1}{4}$

$\sqrt{\cos^2\theta} = \sqrt{\frac{1}{4}}$

$\cos\theta = \pm\frac{1}{2}$

$\boxed{\theta = \frac{\pi}{3}, \frac{5\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}}$

19. $(\cos\theta - 1)^2 = \sin^2\theta$

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

$\cos^2\theta - 2\cos\theta + 1 = \sin^2\theta$

$-\sin^2\theta \quad -\sin^2\theta$

$\cos^2\theta - 2\cos\theta + 1 - \sin^2\theta = 0$

$\cos^2\theta - 2\cos\theta + \cos^2\theta = 0$

$2\cos^2\theta - 2\cos\theta = 0$

$2\cos\theta(\cos - 1) = 0$

$2\cos\theta = 0 \qquad \cos\theta - 1 = 0$

$\cos\theta = 0 \qquad \cos\theta = 1$

$\theta = \cancel{\frac{\pi}{2}}, \frac{3\pi}{2} \qquad \theta = 0$

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20. $\cos\theta \tan\theta - \sin^2\theta = 0$

$\cos\theta \cdot \frac{\sin\theta}{\cos\theta} - \sin^2\theta = 0$

$\sin\theta - \sin^2\theta = 0$

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

$\sin\theta = 0 \qquad 1 - \sin\theta = 0$

$\theta = 0, \pi \qquad \sin\theta = 1$

$\theta = \frac{\pi}{2}$

$\tan\frac{\pi}{2}$ is undefined

$n\pi$

21. $3\sin^2\theta + 6 = 2\sin^2\theta + 7$

$-2\sin^2 \quad -6 \qquad -2\sin^2 \quad -6$

$\sin^2\theta = 1$

$\sin\theta = \pm 1$

$\theta = \frac{\pi}{2}, \frac{3\pi}{2}$

$\frac{\pi}{2} + n\pi$

22. $\sin\theta + \cos\theta = 0$

$-\cos\theta \quad -\cos\theta$

$(\sin\theta)^2 = (-\cos\theta)^2$

$\sin^2\theta = \cos^2\theta$

$1 - \cos^2\theta = \cos^2\theta$

$+\cos^2\theta \quad +\cos^2\theta$

$\frac{1}{2} = \frac{2\cos^2\theta}{2}$

$\pm\sqrt{\frac{1}{2}} = \sqrt{\cos^2\theta}$

$\pm\frac{1}{\sqrt{2}} = \cos\theta$

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

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

$\theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

check 0°, 90°

$\theta = \frac{3\pi}{4}, \frac{7\pi}{4}$

OR $\frac{3\pi}{4} + n\pi$

23. $\sec\theta + \tan\theta = 0$

$\sec\theta = -\tan\theta$

$\sec^2\theta = \tan^2\theta$

$\tan^2\theta + 1 = \tan^2\theta$

$-\tan^2\theta \quad -\tan^2\theta$

$1 \neq 0$ no solution

24. $3 - 3\cos^2\theta = 1 + \sin^2\theta$

$3(1 - \cos^2\theta) = 1 + \sin^2\theta$

$3\sin^2\theta = 1 + \sin^2\theta$

$-\sin^2\theta \quad -\sin^2\theta$

$\frac{2\sin^2\theta}{2} = \frac{1}{2}$

$\sin^2\theta = \frac{1}{2}$

$\sin\theta = \pm\frac{1}{\sqrt{2}}$

$\sin\theta = \pm\frac{\sqrt{2}}{2}$

$\theta = \frac{5\pi}{4}, \frac{7\pi}{4}$

$= \frac{\pi}{4}, \frac{3\pi}{4}$

25. $185 = \frac{82^2 \sin 2\theta}{32}$

$\frac{5920}{6724} = \sin 2\theta$

$\sin^{-1}\left(\frac{5920}{6724}\right) = 2\theta$

61.69° or $118.31^\circ = 2\theta$

$\theta = 30.8^\circ, 59.2^\circ$

26.

a. $75 + 70\sin\left(\frac{\pi}{25}(0) - \frac{\pi}{2}\right)$

$75 + 70\sin(-\pi/2)$

$75 + 70(-1) = 75 - 70 = \boxed{5 \text{ ft}}$

b. $145 = 75 + 70\sin\left(\frac{\pi}{25}t - \pi/2\right)$

$70 = 70\sin(\pi/25t - \pi/2)$

$1 = \sin(\pi/25t - \pi/2)$

$\sin^{-1}(1) = \pi/25t - \pi/2$

$\pi/2 = \pi/25t - \pi/2$

$\pi = \pi/25t$

$\boxed{t = 25}$