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#1-26 all

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1. $\cot\theta = 4$

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

$(4)^2 + 1 = \csc^2\theta$

$16 + 1 = \csc^2\theta$

$\csc\theta = \sqrt{17}$

$\sin\theta = \frac{1}{\sqrt{17}} = \frac{\sqrt{17}}{17}$

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

$(\frac{1}{4})^2 + 1 = \sec^2\theta$

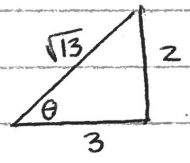
$\frac{1}{16} + 1 = \sec^2\theta$

$\frac{17}{16} = \sec^2\theta$

$\frac{\sqrt{17}}{4} = \sec\theta$

$\frac{4}{\sqrt{17}} = \frac{4\sqrt{17}}{17} = \cos\theta$

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



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

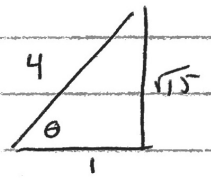
$13 = c^2$

$c = \sqrt{13}$

$\sin\theta = \frac{2}{\sqrt{13}} = \frac{2\sqrt{13}}{13}$

$\sec\theta = -\frac{\sqrt{13}}{3}$

3. $\cos\theta = \frac{1}{4}$



$1^2 + b^2 = 4^2$

$b^2 = 15$

$b = \sqrt{15}$

$\tan\theta = \sqrt{15}$

$\csc\theta = \frac{4}{\sqrt{15}} = \frac{4\sqrt{15}}{15}$

4. $\frac{\sin(-x)}{\tan(-x)} = \frac{-\sin x}{-\tan x} = \frac{\sin x}{\frac{\sin x}{\cos x}} = \sin x \cdot \frac{\cos x}{\sin x} = \cos x$

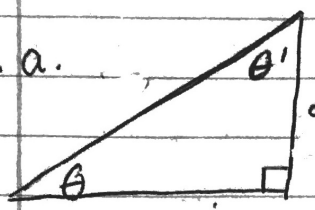
5. $\frac{\sec^2 x}{\cot^2 x + 1} = \frac{\sec^2 x}{\csc^2 x} = \frac{\frac{1}{\cos^2 x}}{\frac{1}{\sin^2 x}} = \frac{1}{\cos^2 x} \cdot \frac{\sin^2 x}{1} = \tan^2 x$

6. $\frac{\sin(90-x)}{\cot^2(90-x)+1} = \frac{\sin(90-x)}{\csc^2(90-x)} = \frac{\cos(x)}{\sec^2(x)} = \frac{\cos x}{\frac{1}{\cos^2 x}} = \cos x \cdot \frac{\cos^2 x}{1} = \cos^3 x$

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

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

8. a.



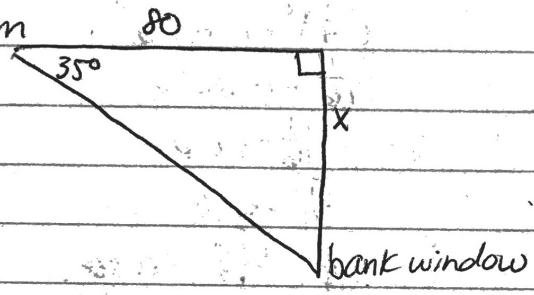
$\theta' = 180 - 90 - \theta$

$\theta' = 90 - \theta$

$\cos\theta' = \cos(90-\theta)$

$= \sin(\theta)$

b. Tim



$\tan 35 = \frac{x}{80}$

$x = 56$ ft

9. D. $\frac{1}{\sin(90-\theta)} = \frac{1}{\cos\theta} = \sec\theta$

10. $\frac{\cos\theta}{1+\sin\theta} - \frac{\cos\theta}{1-\sin\theta} = -2\tan\theta$

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

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

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

$-2\tan\theta$ ✓

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

$(1+\cot^2\theta) + (\cos^2\theta - 1) - \cos^2\theta - \cot^2\theta = 0$

$0 = 0$ ✓

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

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

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

$\sin\theta + \frac{\cos^2\theta}{\sin\theta}$

$\frac{\sin^2\theta}{\sin\theta} + \frac{\cos^2\theta}{\sin\theta}$

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

$\csc\theta$ ✓

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

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

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

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

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

$\sec\theta - \tan\theta$ ✓

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

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

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

$\frac{\cot\theta}{\sin\theta\cos\theta} + \frac{1}{\sin\theta}$

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

$\frac{\cos\theta}{\sin\theta} \cdot \frac{1}{\sin\theta\cos\theta} + \csc\theta$

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

$\csc^2\theta + \csc\theta$

$(\cot^2\theta + 1) + \csc\theta$

$\cot^2\theta + \csc\theta + 1$ ✓

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

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

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

$\frac{1}{(1-\sin\theta)\sin\theta}$

$\frac{1}{1-\sin\theta} \cdot \frac{1}{\sin\theta}$

$\frac{1}{1-\sin\theta} \cdot \csc\theta$

$\frac{\csc\theta}{1-\sin\theta}$ ✓

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

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

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

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

$\theta = 5\pi/6, 7\pi/6$

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

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

$\tan\theta = +1$

$\theta = \pi/4, 5\pi/4$

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

$4\cos^2\theta = 1$

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

$\cos\theta = \pm 1/2$

$\theta = \pi/3, 2\pi/3, 4\pi/3, 5\pi/3$

19. $\cos\theta - 1 = \sin\theta$

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

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

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

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

$2\cos\theta = 0$ $\quad \cos\theta = 1$

$\theta = \pi/2, 3\pi/2$ $\quad \theta = 0$

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

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

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

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

$\sin\theta = 0$ $\quad \sin\theta = 1$

$\theta = 0, \pi$ $\quad \theta = \pi/2$

$\theta = \pi n, n \in \mathbb{Z}$

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

$\sin^2\theta = 1$

$\sin\theta = \pm 1$ $\quad \theta = 0, \pi/2, 3\pi/2, \ldots$

$\theta = \pi/2 + \pi n, n \in \mathbb{Z}$

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

$\sin\theta = -\cos\theta$

$\theta = 3\pi/4, 7\pi/4, \ldots$

$\theta = 3\pi/4 + \pi n, n \in \mathbb{Z}$

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

$\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta} = 0$

$\frac{1 + \sin\theta}{\cos\theta} = 0$

$1 + \sin\theta = 0$

$\sin\theta = -1$

$\theta = 3\pi/2$

no solution

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

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

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

$2\sin^2\theta = 1$

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

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

$\theta = \pi/4, 3\pi/4, 5\pi/4, 7\pi/4, \ldots$

$\pi/4 + \pi/2 n, n \in \mathbb{Z}$

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

$5,920 = 6,724 \sin(2\theta)$

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

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

$\theta = 30.8°, 59.2°$

26a. $h = 75 + 70 \sin(\pi/25 \cdot 0 - \pi/2)$

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

$= 75 + 70(-1)$

$= 5$ ft

b. $145 = 75 + 70 \sin(\pi/25\, t - \pi/2)$

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

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

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

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

$\pi = \pi/25\, t$

$25 \text{ sec} = t$