NAME _____ DATE _____ PERIOD _____

13-1 Skills Practice

Trigonometric Identities

Find the exact value of each expression if $0° < \theta < 90°$.

1. If $\tan \theta = 1$, find $\sec \theta$.
$\sqrt{2}$

2. If $\tan \theta = \frac{1}{2}$, find $\cos \theta$.
$\frac{2\sqrt{5}}{5}$

3. If $\sec \theta = 2$, find $\cos \theta$.
$\frac{1}{2}$

4. If $\cos \theta = \frac{8}{17}$, find $\csc \theta$.
$\frac{17}{15}$

Find the exact value of each expression if $90° < \theta < 180°$.

5. If $\cos \theta = -\frac{4}{5}$, find $\sin \theta$.
$\frac{3}{5}$

6. If $\cot \theta = -\frac{3}{2}$, find $\cos \theta$.
$-\frac{3\sqrt{13}}{13}$

Find the exact value of each expression if $180° < \theta < 270°$.

7. If $\tan \theta = 1$, find $\cos \theta$.
$-\frac{\sqrt{2}}{2}$

8. If $\sin \theta = -\frac{\sqrt{2}}{2}$, find $\tan \theta$.
1

9. If $\csc \theta = -2$, find $\cos \theta$.
$-\frac{\sqrt{3}}{2}$

10. If $\cos \theta = -\frac{2\sqrt{5}}{5}$, find $\tan \theta$.
$\frac{1}{2}$

11. If $\csc \theta = -2$, find $\cot \theta$.
$\sqrt{3}$

12. If $\sin \theta = -\frac{5}{13}$, find $\tan \theta$.
$\frac{5}{12}$

Simplify each expression.

13. $\sin \theta \sec \theta$ $\tan \theta$

14. $\csc \theta \sin \theta$ 1

15. $\cot \theta \sec \theta$ $\csc \theta$

16. $\frac{\cos \theta}{\sec \theta}$ $\cos^2 \theta$

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

18. $\csc \theta \tan \theta - \tan \theta \sin \theta$ $\cos \theta$

19. $\frac{1 - \sin^2 \theta}{\sin \theta + 1}$ $1 - \sin \theta$

20. $\csc \theta + \cot \theta$ $\frac{1 + \cos \theta}{\sin \theta}$

21. $\frac{\sin^2 \theta + \cos^2 \theta}{1 - \cos^2 \theta}$ $\csc^2 \theta$

22. $1 + \frac{\tan^2 \theta}{1 + \sec \theta}$ $\sec \theta$

Lesson 13-1

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Skills Practice

$0° < \theta < 90°$

1) $\tan\theta = 1$

$\sec\theta = \underline{+\sqrt{2}}$

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

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

$2 = \sec^2\theta$

$\sec = \pm\sqrt{2}$

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2) $\tan\theta = \frac{1}{2}$

$\cos\theta = \underline{+\frac{2\sqrt{5}}{5}}$

find $\sec\theta$ then flip it!

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

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

$\frac{5}{4} = \sec^2\theta$

$\pm\frac{\sqrt{5}}{2} = \sec\theta$

$\cos\theta = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$

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3) $\sec\theta = 2$

$\cos\theta = \underline{+\frac{1}{2}}$

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

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

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

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4) $\cos\theta = \frac{8}{17}$

$\csc\theta = \underline{+\frac{17}{15}}$

need to find $\sin\theta$ then flip it!

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

$\left(\frac{8}{17}\right)^2 + \sin^2\theta = 1$

$\frac{64}{289} + \sin^2\theta = 1$

$\sin^2\theta = \frac{225}{289}$, 15

$\sin\theta = \pm\frac{15}{17}$

$90° < \theta < 180°$ Quadrant II

5) $\cos\theta = \frac{-4}{5}$

$\boxed{\sin\theta = +\frac{3}{5}}$

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

$\left(\frac{-4}{5}\right)^2 + \sin^2\theta = 1$

$\frac{16}{25} + \sin^2\theta = 1$

$\sin^2\theta = \frac{9}{25}$

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

sin pos in QII

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b) $\cot\theta = -\frac{3}{2}$

$\boxed{\cos\theta = -\frac{3\sqrt{13}}{3}}$

- flip $\cot\theta$ so $\tan\theta = -\frac{2}{3}$
- find $\sec\theta$ then flip for $\cos\theta$

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

$1 + \left(\frac{-2}{3}\right)^2 = \sec^2\theta$

$\frac{9}{9} + \frac{4}{9} = \sec^2\theta$

$\frac{13}{9} = \sec^2\theta$

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

$\cos\theta = \frac{\pm 3}{\sqrt{13}} = \pm\frac{3\sqrt{13}}{13}$

cos neg in QII

$180^\circ < \theta < 270^\circ$ Quadrant III

8) $\sin\theta = -\frac{\sqrt{2}}{2}$

$\tan\theta = +1$

find $\cos\theta$ first!

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

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

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

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

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

tan pos in QIII

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\tan\theta = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}}$

$\tan\theta = -1$

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10) $\cos\theta = \frac{-2\sqrt{5}}{5}$

$\tan\theta = +\frac{1}{2}$

find $\sin\theta$ first

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

$\left(\frac{-2\sqrt{5}}{5}\right)^2 + \sin^2\theta = 1$

$\frac{20}{25} + \sin^2\theta = 1$

$\sin^2\theta = \frac{5}{25}$

$\sin\theta = \pm\frac{\sqrt{5}}{5}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\tan\theta = \frac{\frac{\sqrt{5}}{5}}{\frac{-2\sqrt{5}}{5}} = \frac{\sqrt{5}}{5}\cdot\frac{5}{2\sqrt{5}} = \frac{1}{2}$

tan pos in QIII

$180 < \theta < 270$ Quadrant III

7) $\tan\theta = 1$

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

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

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

$\sec\theta = \pm\sqrt{2}$

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

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

neg in QIII

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9) $\csc\theta = -2$

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

neg in QIII

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

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

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

$\cos^2\theta = \frac{3}{4}$

$\cos\theta = \pm\frac{\sqrt{3}}{2}$

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11) $\csc\theta = -2$

$\cot\theta = \sqrt{3}$

cot pos in QIII

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

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

$\cot^2\theta = 3$

$\cot\theta = \pm\sqrt{3}$

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12) $\sin\theta = -\frac{5}{13}$

$\tan\theta = \frac{5}{12}$

tan pos in QIII

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

$\left(-\frac{5}{13}\right)^2 + \cos^2\theta = 1$

$\frac{25}{169} + \cos^2\theta = 1$

$\cos^2\theta = \frac{144}{169}$

$\cos\theta = \pm\frac{12}{13}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\tan\theta = \frac{\frac{5}{13}}{\frac{12}{13}} = \frac{5}{12}$

13) $\sin\theta \sec\theta$

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

$\frac{\sin\theta}{\cos\theta} = \boxed{\tan\theta}$

14) $\csc\theta \sin\theta$

$\frac{1}{\sin\theta} \cdot \sin\theta = \boxed{1}$

15) $\cot\theta \sec\theta$

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

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

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

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

17) $\tan\theta + \cot\theta$

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

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

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

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

$\boxed{\sec\theta \csc\theta}$

18) $\csc\theta \tan\theta - \tan\theta \sin\theta$

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

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

$\boxed{\cos\theta}$

19) $\frac{1-\sin^2\theta}{\sin\theta+1}$ ← factor!

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

$\boxed{1-\sin\theta}$

20) $\csc\theta + \cot\theta$

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

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

21) $$\frac{\sin^2\theta + \cos^2\theta}{1 - \cos^2\theta} = \frac{1}{\sin^2\theta} = \boxed{\csc^2\theta}$$

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22) $$1 + \frac{\tan^2\theta}{1+\sec\theta}$$

$$1 + \frac{\sec^2\theta - 1}{1+\sec\theta}$$

$$1 + \frac{(\sec\theta+1)(\sec\theta-1)}{1+\sec\theta}$$

$$1 + \sec\theta - 1 = \boxed{\sec\theta}$$