

**5.1 Day 1 Assignment: Do all work on your own paper. Calculator allowed.****For #1 – 17: Verify the following identities:**

1)  $\sin x \sec x = \tan x$       2)  $\cos x \csc x = \cot x$       3)  $\cot x \sec x \sin x = 1$

4)  $\sec x - \sec x \sin^2 x = \cos x$       5)  $\csc \theta - \sin \theta = \cot \theta \cos \theta$

6)  $\frac{\tan \theta \cot \theta}{\csc \theta} = \sin \theta$       7)  $\sin^2 \theta (1 + \cot^2 \theta) = 1$       8)  $\frac{\tan^2 t}{\sec t} = \sec t - \cos t$

9)  $\frac{1 - \cos \theta}{\sin \theta} = \csc \theta - \cot \theta$       10)  $\frac{\sin t}{\csc t} + \frac{\cos t}{\sec t} = 1$       11)  $\tan t + \frac{\cos t}{1 + \sin t} = \sec t$

12)  $1 - \frac{\sin^2 x}{1 + \cos x} = \cos x$       13)  $\frac{\cos x}{1 - \sin x} + \frac{1 - \sin x}{\cos x} = 2 \sec x$       14)  $\frac{\sec x - \csc x}{\sec x + \csc x} = \frac{\tan x - 1}{\tan x + 1}$

15)  $\tan^2 2x + \sin^2 2x + \cos^2 2x = \sec^2 2x$       16)  $\frac{\tan 2\theta + \cot 2\theta}{\csc 2\theta} = \sec 2\theta$

17)  $\frac{\tan x + \tan y}{1 - \tan x \tan y} = \frac{\sin x \cos y + \cos x \sin y}{\cos x \cos y - \sin x \sin y}$

**5.1 Day 2 Assignment: Do all work on your own paper. Calculator allowed.****For #1 – 16: Verify the following identities.**

1)  $\tan(-x) \cdot \cos x = -\sin x$       2)  $\cot(-x) \sin x = -\cos x$       3)  $\csc x - \csc x \cos^2 x = \sin x$

4)  $\cos^2 x - \sin^2 x = 2 \cos^2 x - 1$       5)  $\frac{\cos \theta \sec \theta}{\cot \theta} = \tan \theta$       6)  $\cos^2 \theta (1 + \tan^2 \theta) = 1$

7)  $\frac{\sec^2 t}{\tan t} = \sec t \csc t$       8)  $\frac{1 - \sin \theta}{\cos \theta} = \sec \theta - \tan \theta$       9)  $\frac{\sin t}{\tan t} + \frac{\cos t}{\cot t} = \sin t + \cos t$

10)  $1 - \frac{\cos^2 x}{1 + \sin x} = \sin x$       11)  $\frac{\sin x}{\cos x + 1} + \frac{\cos x - 1}{\sin x} = 0$       12)  $\frac{\csc x - \sec x}{\csc x + \sec x} = \frac{\cot x - 1}{\cot x + 1}$

13)  $\cot^2 2x + \cos^2 2x + \sin^2 2x = \csc^2 2x$       14)  $\frac{\cot x + \cot y}{1 - \cot x \cot y} = \frac{\cos x \sin y + \sin x \cos y}{\sin x \sin y - \cos x \cos y}$

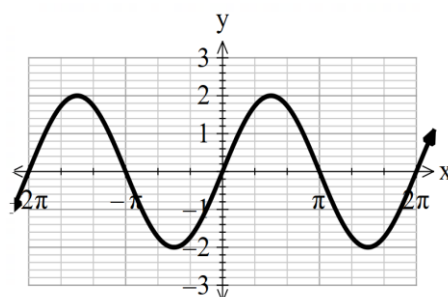
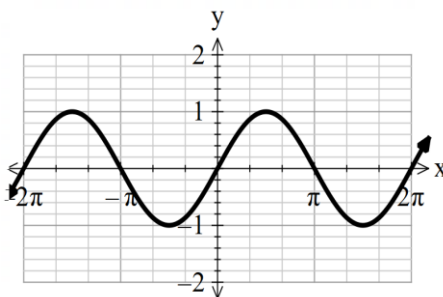
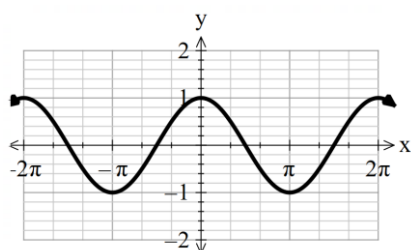
15)  $\frac{\sec t + 1}{\tan t} = \frac{\tan t}{\sec t - 1}$       16)  $\frac{\sin \theta - \cos \theta}{\sin \theta} + \frac{\cos \theta - \sin \theta}{\cos \theta} = 2 - \sec \theta \csc \theta$

**For 17 – 19: Use the provided graph to complete the right side of the identity.**

17)  $\frac{(\sec x + \tan x)(\sec x - \tan x)}{\sec x} = ?$

18)  $\frac{\sec^2 x \csc x}{\sec^2 x + \csc^2 x} = ?$

19)  $\frac{\cos x + \cot x \sin x}{\cot x} = ?$



More on next page...

## 5.1 Day 2, continued...

#20 – 22: BONUS

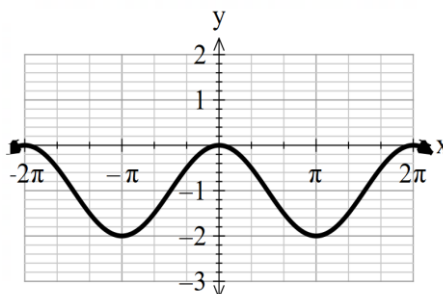
BONUS! For #20 – 21: verify each identity.

20)  $\frac{\cos^2 x - \sin^2 x}{1 - \tan^2 x} = \cos^2 x$

21)  $\frac{\sin x + \cos x}{\sin x} - \frac{\cos x - \sin x}{\cos x} = \sec x \csc x$

BONUS! For 22: Use the provided graph to complete the right side of the identity.

22)  $\frac{\cos x \tan x - \tan x + 2 \cos x - 2}{\tan x + 2} = ?$



## 5.2 Day 1 Assignment: Do all work on your own paper. Calculator allowed.

1) Find the exact value:  $\cos(45^\circ - 30^\circ)$ 2) The expression  $\cos 50^\circ \cos 20^\circ + \sin 50^\circ \sin 20^\circ$  is the right side of the formula  $\cos(\alpha - \beta)$ . Find the following:

- Identify  $\alpha$  and  $\beta$  in each expression.
- Write the expression as the cosine of an angle.
- Find the exact value of the expression.

For 3 – 4: Verify the identity.

3)  $\frac{\cos(\alpha - \beta)}{\cos \alpha \sin \beta} = \tan \alpha + \cot \beta$

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

For 5 – 6, find the exact value of each expression using a sum or difference identity.

5)  $\sin(45^\circ - 30^\circ)$

6)  $\sin 105^\circ$

For 7 – 9, write each expression as the sine, cosine, or tangent of an angle. Then find the exact value of the expression.

7)  $\sin 25^\circ \cos 5^\circ + \cos 25^\circ \sin 5^\circ$

8)  $\frac{\tan 10^\circ + \tan 35^\circ}{1 - \tan 10^\circ \tan 35^\circ}$

9)  $\sin \frac{5\pi}{12} \cos \frac{\pi}{4} - \cos \frac{5\pi}{12} \sin \frac{\pi}{4}$

For 10 – 14, verify the identity.

10)  $\sin\left(x + \frac{\pi}{2}\right) = \cos x$

11)  $\tan(2\pi - x) = -\tan x$

12)  $\frac{\sin(\alpha - \beta)}{\cos \alpha \cos \beta} = \tan \alpha - \tan \beta$

13)  $\frac{\cos(x+h) - \cos x}{h} = \cos x \frac{\cos h - 1}{h} - \sin x \frac{\sin h}{h}$

14)  $\sin 2\alpha = 2 \sin \alpha \cos \alpha$

More on next page...

**5.2 Day 1 Assignment continued.****For 15 – 16 , find the exact value of the following under given conditions.**

a)  $\cos(\alpha + \beta)$       b)  $\sin(\alpha + \beta)$       c)  $\tan(\alpha + \beta)$

15)  $\sin \alpha = \frac{3}{5}$ ,  $\alpha$  lies in quadrant I, and  $\sin \beta = \frac{5}{13}$ ,  $\beta$  is in quadrant II.

16)  $\tan \alpha = -\frac{3}{4}$ ,  $\alpha$  lies in quadrant II, and  $\cos \beta = \frac{1}{3}$ ,  $\beta$  is in quadrant I.

**5.2 Day 2 Assignment: Do all work on your own paper. Calculator allowed.****For 1 – 2: Find the exact value of each expression.**

1)  $\cos(120^\circ - 45^\circ)$

2)  $\cos\left(\frac{3\pi}{4} - \frac{\pi}{6}\right)$

**For 3 – 5, each expression is the right side of the formula  $\cos(\alpha - \beta)$ . Find the following:**

- a) Identify  $\alpha$  and  $\beta$  in each expression.
- b) Write the expression as the cosine of an angle.
- c) Find the exact value of the expression.

3)  $\cos 50^\circ \cos 5^\circ + \sin 50^\circ \sin 5^\circ$

4)  $\cos \frac{5\pi}{12} \cos \frac{\pi}{12} + \sin \frac{5\pi}{12} \sin \frac{\pi}{12}$

5)  $\cos \frac{5\pi}{18} \cos \frac{\pi}{9} + \sin \frac{5\pi}{18} \sin \frac{\pi}{9}$

**For 6 – 7, verify the identity.**

6)  $\frac{\cos(\alpha - \beta)}{\sin \alpha \sin \beta} = \cot \alpha \cot \beta + 1$

7)  $\cos\left(x - \frac{5\pi}{4}\right) = -\frac{\sqrt{2}}{2}(\cos x + \sin x)$

**For 8 – 11, find the exact value of each expression using a sum or difference identity.**

8)  $\sin(60^\circ - 45^\circ)$

9)  $\sin 75^\circ$

10)  $\cos 105^\circ$

11)  $\tan\left(\frac{\pi}{3} + \frac{\pi}{4}\right)$

**For 12 – 14, write each expression as the sine, cosine, or tangent of an angle. Then find the exact value of the expression.**

12)  $\sin 40^\circ \cos 20^\circ + \cos 40^\circ \sin 20^\circ$

13)  $\frac{\tan 50^\circ - \tan 20^\circ}{1 + \tan 50^\circ \tan 20^\circ}$

14)  $\frac{\tan\left(\frac{\pi}{5}\right) + \tan\left(\frac{4\pi}{5}\right)}{1 - \tan\left(\frac{\pi}{5}\right) \tan\left(\frac{4\pi}{5}\right)}$

**For 15 – 17, verify the identity.**

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

16)  $\frac{\sin(x+h) - \sin x}{h} = \cos x \frac{\sin h}{h} + \sin x \frac{\cos h - 1}{h}$

17)  $\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$  (hint: write  $\cos 2\alpha$  as  $\cos(\alpha + \alpha)$ )

18) Derive the identity for  $\tan(\alpha - \beta)$  using  $\tan(\alpha - \beta) = \tan[\alpha + (-\beta)]$ . After applying the formula for the tangent of the sum of angles, use the fact that the tangent is an odd function.**More on next page...**

**5.2 Day 2 Assignment, continued.**

For exercises 19 – 21, find the exact value of the following under given conditions.

a)  $\cos(\alpha + \beta)$       b)  $\sin(\alpha + \beta)$       c)  $\tan(\alpha + \beta)$

19)  $\sin \alpha = \frac{4}{5}$ ,  $\alpha$  lies in quadrant I, and  $\sin \beta = \frac{7}{25}$ ,  $\beta$  is in quadrant II.

20)  $\tan \alpha = -\frac{4}{3}$ ,  $\alpha$  lies in quadrant II, and  $\cos \beta = \frac{2}{3}$ ,  $\beta$  is in quadrant I.

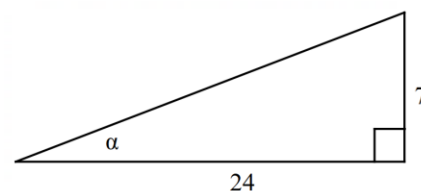
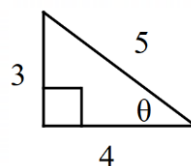
21)  $\cos \alpha = \frac{8}{17}$ ,  $\alpha$  lies in quadrant IV, and  $\sin \beta = -\frac{1}{2}$ ,  $\beta$  is in quadrant III.

**5.3 Day 1 Assignment: Do all work on your own paper. Calculator allowed.**

For #1 – 2: Use the figures to find the exact value of each trigonometric function.

1)  $\sin 2\theta$

2)  $\cos 2\alpha$



For #3 – 5: Write each expression as the sine, cosine or tangent of a double angle. Then find the exact value of the expression.

3)  $2 \sin 15^\circ \cos 15^\circ$

4)  $\cos^2 75^\circ - \sin^2 75^\circ$

5)  $\frac{2 \tan\left(\frac{\pi}{12}\right)}{1 - \tan^2\left(\frac{\pi}{12}\right)}$

For #6 – 7: Verify each identity.

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

7)  $\sin^2 x + \cos 2x = \cos^2 x$

For #8 – 9: Use a half-angle formula to find the exact value of each trigonometric function.

8)  $\cos 22.5^\circ$

9)  $\cos 157.5^\circ$

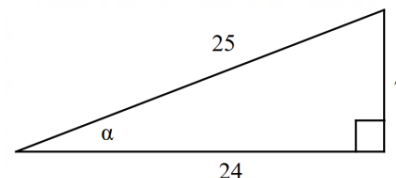
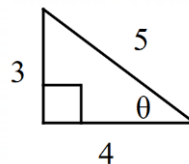
For #10 – 13: Use the figures to find the exact value of each trigonometric function.

10)  $\sin \frac{\theta}{2}$

11)  $\cos \frac{\theta}{2}$

12)  $\tan \frac{\theta}{2}$

13)  $2 \sin \frac{\theta}{2} \cos \frac{\theta}{2}$



For #14 – 15: Use the given information to find the exact value of each of the following.

a)  $\cos\left(\frac{\alpha}{2}\right)$

b)  $\sin\left(\frac{\alpha}{2}\right)$

c)  $\tan\left(\frac{\alpha}{2}\right)$

14)  $\tan \alpha = \frac{4}{3}$ ,  $180^\circ < \alpha < 270^\circ$

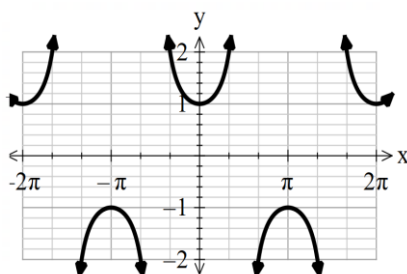
15)  $\tan \alpha = \frac{8}{15}$ ,  $180^\circ < \alpha < 270^\circ$

More on the next page...

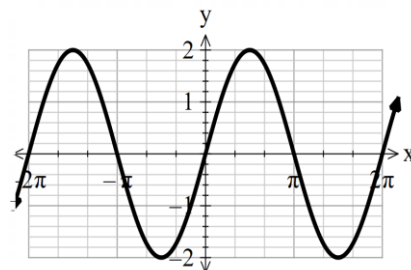
## 5.3 Day 1 Assignment continued.

**For #16 – 17:** Half of an identity and the graph of this half are given. Use the graph to make a conjecture as to what the right side of the identity should be. Then prove your conjecture.

16)  $\frac{\sin 2x}{\sin x} - \frac{\cos 2x}{\cos x} = ?$



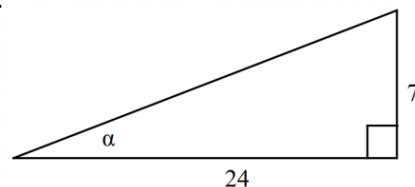
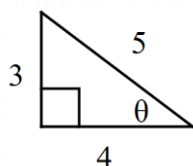
17)  $\sin 2x \sec x = ?$



## 5.3 Day 2 Assignment: Do all work on your own paper. Calculator allowed.

**For #1 – 2:** Use the figures to find the exact value of each trigonometric function.

1)  $\cos 2\theta$       2)  $\tan 2\theta$



**For #3 – 5:** Use the given information to find the exact value of each of the following.

a)  $\sin(2\alpha)$       b)  $\cos(2\alpha)$       c)  $\tan(2\alpha)$

3)  $\sin \theta = \frac{15}{17}$ ,  $\theta$  lies in quadrant II

4)  $\cot \theta = 2$ ,  $\theta$  lies in quadrant III

5)  $\sin \theta = -\frac{9}{41}$ ,  $\theta$  lies in quadrant III

**For #6 – 7:** Verify each identity.

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

7)  $\cot x = \frac{\sin 2x}{1 - \cos 2x}$

**For #8 – 9:** Use a half-angle formula to find the exact value of each trigonometric function.

8)  $\sin 15^\circ$

9)  $\tan 75^\circ$

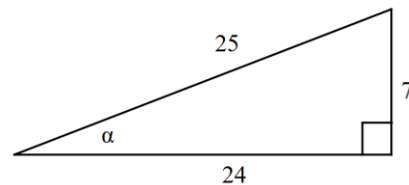
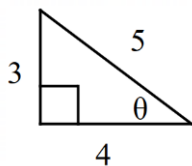
**For #10 – 13:** Use the figures to find the exact value of each trigonometric function.

10)  $\sin \frac{\alpha}{2}$

11)  $\cos \frac{\alpha}{2}$

12)  $\tan \frac{\alpha}{2}$

13)  $2 \sin \frac{\alpha}{2} \cos \frac{\alpha}{2}$



More on the next page.

## 5.3 Day 2 Assignment, continued.

For #14 – 15: use the given information to find the exact value of each of the following.

a)  $\sin\left(\frac{\alpha}{2}\right)$     b)  $\cos\left(\frac{\alpha}{2}\right)$     c)  $\tan\left(\frac{\alpha}{2}\right)$

14)  $\sec a = -\frac{13}{5}$ ,  $\frac{\pi}{2} < a < \pi$

15)  $\sec a = -3$ ,  $\frac{\pi}{2} < a < \pi$

**Power Reducing Assignment: Do all work on your own paper. Calculator allowed.**

For #1 – 4: Use the power-reducing formula to rewrite each expression as an equivalent expression that does not contain powers of trigonometric functions greater than 1.

1)  $6 \sin^4 x$

2)  $10 \cos^4 x$

3)  $\sin^2 x \cos^2 x$

4)  $8 \sin^2 x \cos^2 x$

For #5 – 8: Verify each identity.

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

6)  $\sin^2\left(\frac{\theta}{2}\right) = \frac{\csc \theta - \cot \theta}{2 \csc \theta}$

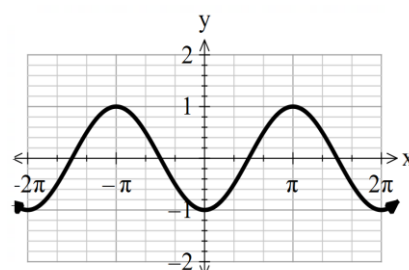
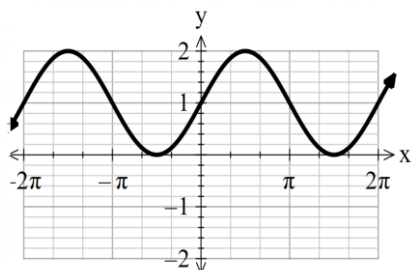
7)  $\cos^2\left(\frac{\theta}{2}\right) = \frac{\sin \theta + \tan \theta}{2 \tan \theta}$

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

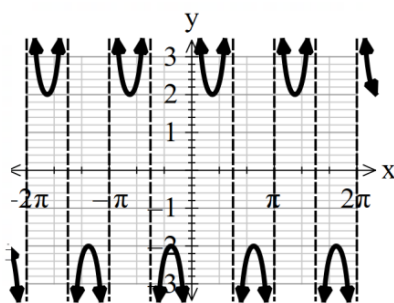
For #9 – 13: Half of an identity and the graph of this half are given. Use the graph to make a conjecture as to what is the right side of the identity should be. Then prove your conjecture.

9)  $\left(\sin\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right)\right)^2 = ?$

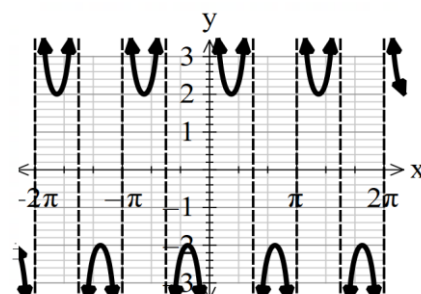
10)  $\sin^2\left(\frac{x}{2}\right) - \cos^2\left(\frac{x}{2}\right) = ?$



11)  $\frac{\csc^2 x}{\cot x} = ?$



12)  $\tan x + \cot x = ?$



13)  $1 - 8 \sin^2 x \cos^2 x = ?$

