Calculus 1

Q1 | Week 4

August 24–28, 2026

Name: ____

Homework

Monday	Tuesday	Wednesday	Thursday	Friday

1. Angle and Trigonometric Value Reference

An *angle* is the input. A *trigonometric value* is the output.
Example: In $\sin(30°) = 1/2$, 30° is the *angle* and 1/2 is the *trigonometric value*.

	0°	30°	45°	60°	90°
Angle in radians	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
Sine value					
Cosine value	1	$\sqrt{3}/2$	$\sqrt{2}/2$	1/2	0
Tangent value					

Use $\sin \theta = \cos(90° - \theta)$ and $\tan \theta = \sin \theta / \cos \theta$. $\tan 90°$ is undefined because $\cos 90° = 0$.

2. Quadrant Reference

Quadrant	Degree angle range	Radian angle range	Positive trig values
I	$0° < \theta < 90°$		
II	$90° < \theta < 180°$		
III	$180° < \theta < 270°$		
IV	$270° < \theta < 360°$		

Axis angles (0°, 90°, 180°, 270°, and 360°) are not inside any quadrant.
The quadrant determines the signs of x, y, and the trigonometric functions. The radius r is always positive.
Do not assume that θ and 2θ are in the same quadrant.

3. Product-to-Sum Identities

Use Product-to-Sum when the original expression is a product. First identify A and B, then calculate A − B and A + B.

Original product	Equivalent sum or difference
sin A sin B	
cos A cos B	
sin A cos B	
cos A sin B	

Completed Example

Rewrite and evaluate: cos 195° cos 105°.
A = 195°, B = 105°; A − B = 90°, A + B = 300°.
cos 195° cos 105° = ½[cos 90° + cos 300°] = ½[0 + 1/2] = 1/4.

Practice

1. Rewrite and evaluate: cos(13π/12) sin(5π/12).

2. Rewrite as a sum or difference: sin 5θ sin 3θ.

4. Sum-to-Product Identities

Use Sum-to-Product when the original expression is a sum or difference. First find the average, (A + B)/2, and the half-difference, (A − B)/2.

Original sum or difference	Equivalent product
sin A + sin B	
sin A − sin B	
cos A + cos B	
cos A − cos B	

Important: cos A − cos B begins with a negative sign.

Completed Example

Rewrite: sin 5x + sin 3x.
A = 5x, B = 3x; (A + B)/2 = 4x; (A − B)/2 = x.
sin 5x + sin 3x = 2 sin 4x cos x.

Practice

3. Rewrite and evaluate: $\sin(13\pi/12) - \sin(5\pi/12)$.

4. Solve for all real x: $\cos x + \cos 4x = 0$.

5. Power-Reducing Identities

Expression	Power-reducing form
$\sin^2 x$	
$\cos^2 x$	
$\tan^2 x$	

Power-reducing identities rewrite squared or higher-powered trigonometric functions using first powers.

Connection to the Double-Angle Identity

$\cos 2x = 1 - 2\sin^2 x \Rightarrow$ ______________________ $\Rightarrow \sin^2 x =$ ______________________

$\cos 2x = 2\cos^2 x - 1 \Rightarrow$ ______________________ $\Rightarrow \cos^2 x =$ ______________________

Practice

5. Rewrite $\sin^4 x$ using first powers of cosine.

6. Rewrite $\cos^4 x$ using first powers of cosine.