

## Lesson 6.2 sum and difference and double angle Identities

### Lesson 6.2 : Sum, Difference, and Double Angle Identities

$$\left. \begin{aligned} \sin(A+B) &= \sin A \cos B + \cos A \sin B \\ \sin(A-B) &= \sin A \cos B - \cos A \sin B \end{aligned} \right\}$$

$$\left. \begin{aligned} \cos(A+B) &= \cos A \cos B - \sin A \sin B \\ \cos(A-B) &= \cos A \cos B + \sin A \sin B \end{aligned} \right\}$$

$$\left. \begin{aligned} \tan(A+B) &= \frac{\tan A + \tan B}{1 - \tan A \tan B} \\ \tan(A-B) &= \frac{\tan A - \tan B}{1 + \tan A \tan B} \end{aligned} \right\}$$

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### **Exact values**

**Example 1:** Determine the exact value of  $\sin(75^\circ)$ .

↳ think about  $\sin(30^\circ + 45^\circ)$

Note:

$$\sin(30^\circ + 45^\circ) \neq \sin 30^\circ + \sin 45^\circ$$

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**Example 2:** Determine the exact value of  $\cos 40^\circ \cos 20^\circ - \sin 40^\circ \sin 20^\circ$

**Example 3:** Determine the exact value of  $\tan \frac{5\pi}{12}$ .

**Example 4:** Determine the exact value of  $\sec 195^\circ$ .

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**Example 5:** Simplify:  $\sin\left(\theta + \frac{\pi}{2}\right) - \sin\left(\theta - \frac{\pi}{2}\right)$

**Example 6:** p307 #20b

$\angle A$  and  $\angle B$  are both in Quadrant I and  $\sin A = \frac{4}{5}$  and  $\cos B = \frac{12}{13}$ , evaluate  $\cos(A + B)$

Assign p.306-307 #1abd, 2bd, 4, 5b, 8acef, 10, 11c, 19, 20ab

## ***Double Angle Identities***

$$\sin 2A = 2 \sin A \cos A$$

$$\left. \begin{aligned} \cos 2A &= \cos^2 A - \sin^2 A \\ \cos 2A &= 2 \cos^2 A - 1 \\ \cos 2A &= 1 - 2 \sin^2 A \end{aligned} \right\}$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

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Proof:

$$\cos 2A = \cos^2 A - \sin^2 A$$

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**Example 7:** Write the expression as a single trigonometric function

$$2 \sin \frac{\pi}{12} \cos \frac{\pi}{12}$$

**Example 8:**

If  $\cos \theta = \frac{7}{25}$  where  $270^\circ \leq \theta < 360^\circ$  determine the exact values of :

(i)  $\tan 2\theta$

(ii)  $\sin\left(\theta + \frac{3\pi}{2}\right)$

→

## ***Simplify Expressions using Trigonometric Identities***

Example 9:

Simplify and state the restrictions:  $\frac{1 - \cos 2x}{\sin 2x}$

Restrictions:

Simplify:

$$\frac{1 - \cos 2x}{\sin 2x}$$

$$\frac{1 - \cos 2x}{\sin 2x}$$



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Example 10: Simplify:  $\frac{\sin 2x}{\cos 2x + 1}$

Example 11: Simplify  $\frac{\cos 2x + \sin^2 x}{\sin 2x}$



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Example 12: Simplify:  $\frac{\cos^3 x}{\cos 2x + \sin^2 x}$

p.306 #5d

Assign p.306-307 #1ce, 2c, 4, 5ac, 11ab, 15, 16, 19, 20cd