

## Lesson 46 – Addition & Subtraction Identities

Math 2 Honors - Santowski

3/11/2010

IB Math SL1 - Santowski

1

### Fast Five

- True or False (and justify your response)
- (a)  $\sin(A + B) = \sin A + \sin B$
- (b)  $\cos(A - B) = \cos A - \cos B$

3/11/2010

IB Math SL1 - Santowski

2

### (A) Six New Identities (GASP!!)

- Here are six new identities that we call the addition & subtraction identities

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

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

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

3/11/2010

IB Math SL1 - Santowski

3

### (B) Proving Cosine Subtraction Identity

- We will prove

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

- We will use our unit circle to do so .....

3/11/2010

IB Math SL1 - Santowski

4

### (C) Proving Sine Addition Identity

- We will prove

$$\sin(A + B) = \sin A \cos B + \sin B \cos A$$

- We will use right triangle trig to do so

3/11/2010

IB Math SL1 - Santowski

5

### (D) Proving Tan Addition Identity

- You will prove

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

- You will use fundamental trig identities to do so

3/11/2010

IB Math SL1 - Santowski

6

### (E) Using the Addition/Subtraction Identities

- Determine the exact value of  $\sin(15^\circ)$
- Determine the exact value of  $\cos(-195^\circ)$
- Determine the exact value of  $\sec\left(\frac{5\pi}{12}\right)$
- Determine the exact value of  $\tan(255^\circ)$
- If  $\sin(a) = -4/5$  for  $180^\circ \leq a \leq 270^\circ$  and if  $\cos(b) = -5/13$  for  $90^\circ \leq b \leq 180^\circ$ , evaluate  $\tan(a+b)$

3/11/2010

IB Math SL1 - Santowski

7

### (E) Using the Addition/Subtraction Identities

- We can use the new identities to develop new identities:
- Prove the following: (describe each identity from a transformations perspective as well as a unit circle perspective)

$$(a) \cos(\pi + x) = -\cos x$$

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

3/11/2010

IB Math SL1 - Santowski

8

### (E) Using the Addition/Subtraction Identities

- Prove the following:

$$(a) \cos(x+y)\cos y + \sin(x+y)\sin y = \cos x$$

$$(b) 1 + \cot x \tan y = \frac{\sin(x+y)}{\sin x \cos y}$$

3/11/2010

IB Math SL1 - Santowski

9

### (E) Using the Addition/Subtraction Identities

- We can use the new identities to develop new identities:
- Develop a new identity for:
  - (a)  $\sin(2x)$
  - (b)  $\cos(2x)$
  - (c)  $\tan(2x)$

3/11/2010

IB Math SL1 - Santowski

10

### (F) Homework

- S14.4, p914, Q11,13,25,27,33-44all,67,77,78

3/11/2010

IB Math SL1 - Santowski

11