

$$(a+b)(a-b) = a^2 - b^2$$

Warm Up 2/12

Verify the identity.

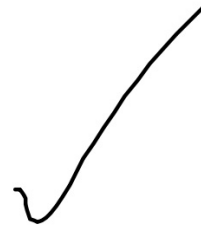
$$\frac{\sec x}{\sec x - \tan x} = \sec x (\sec x + \tan x)$$

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

$$\Rightarrow \frac{\sec x (\sec x + \tan x)}{\sec^2 x - \tan^2 x} = \sec x (\sec x + \tan x)$$

$$\Rightarrow \frac{\sec x (\sec x + \tan x)}{\cancel{\tan^2 x + 1} - \cancel{\tan^2 x}} = \sec x (\sec x + \tan x)$$

$$\Rightarrow \sec x (\sec x + \tan x) = \sec x (\sec x + \tan x)$$

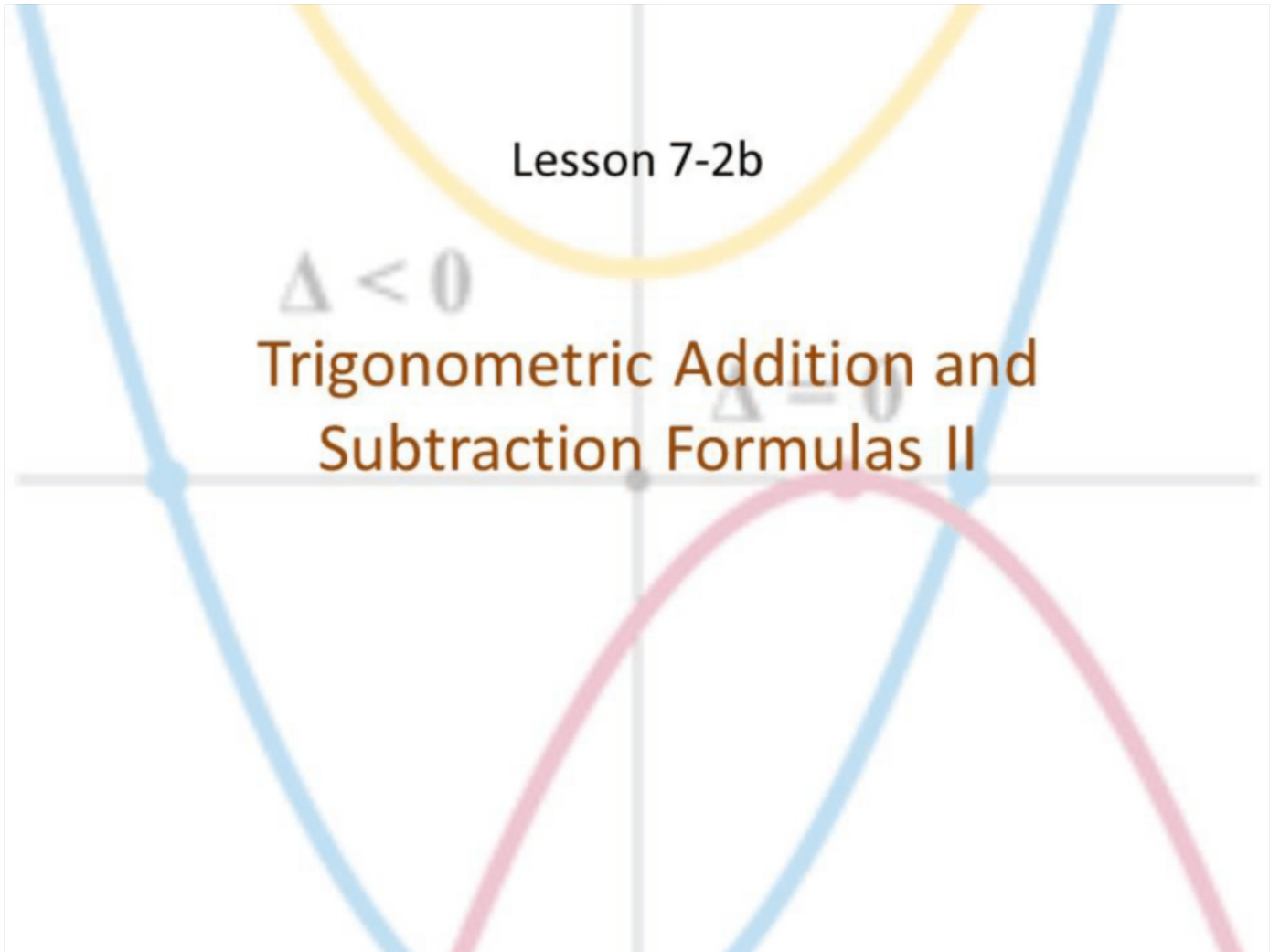


Lesson 7-2b

$\Delta < 0$

Trigonometric Addition and
Subtraction Formulas II

$\Delta = 0$



Objective

Students will...

- Be able to use addition and subtraction formulas to evaluate trig functions and to prove or verify identities.

Addition and Subtraction Formulas

Formulas for Sine: $\sin(s + t) = \sin s \cos t + \cos s \sin t$
 $\sin(s - t) = \sin s \cos t - \cos s \sin t$

Formulas for Cosine: $\cos(s + t) = \cos s \cos t - \sin s \sin t$
 $\cos(s - t) = \cos s \cos t + \sin s \sin t$

Formulas for Tangent: $\tan(s + t) = \frac{\tan s + \tan t}{1 - \tan s \tan t}$

$$\tan(s - t) = \frac{\tan s - \tan t}{1 + \tan s \tan t}$$

Guidelines for Proving Identities

Furthermore, we have some guidelines/tips for proving identities.

1. **Focus on the fractions**: More often than not, identity proofs are more easily done when you work with the side that involves a fraction.
2. **Pick the more “complicated” side**: It’s easier to modify the sides that has less sines or cosines. Generally, rewriting everything as sine or cosine can help you when you are “stuck.”
3. **Use the Known Identities!**: Use algebra and the identities are already known to you. Look to combine multiple fractions into one with a common denominator.



Using Addition and Subtraction Formulas

Prove the following identity: $\cos\left(\frac{\pi}{2} - u\right) = \sin u$

$$\Rightarrow \cos \frac{\pi}{2} \cos u + \sin \frac{\pi}{2} \sin u = \sin u$$

$$\Rightarrow 0 + (1)\sin u = \sin u$$

$$\Rightarrow \sin u = \sin u \checkmark$$

Homework Problems

Prove the following identity:

$$19. \sec\left(\frac{\pi}{2} - u\right) = \csc u$$

$$\Rightarrow \frac{1}{\cos\left(\frac{\pi}{2} - u\right)} = \csc u$$

$$\Rightarrow \frac{1}{\cos\frac{\pi}{2}\cos u + \sin\frac{\pi}{2}\sin u} = \csc u$$

$$\Rightarrow \frac{1}{0 + (1)\sin u} = \csc u$$

$$\Rightarrow \frac{1}{\sin u} = \csc u$$

$$\Rightarrow \csc u = \csc u \quad \checkmark$$

Example

Verify the following identity: $\frac{1+\tan x}{1-\tan x} = \tan\left(\frac{\pi}{4} + x\right)$

Homework Problems

Verify the identity.

$$32. \cos(x + y) + \cos(x - y) = 2 \cos x \cos y$$

$$\Rightarrow \cos x \cos y - \cancel{\sin x \sin y} + \cos x \cos y + \cancel{\sin x \sin y} = 2 \cos x \cos y$$

$$\Rightarrow 2 \cos x \cos y = 2 \cos x \cos y \quad \checkmark$$

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Homework Problems

$$\frac{1}{a} + \frac{2}{a} = \frac{1+2}{a}$$

Verify the identity.

34. $\cot(x+y) = \frac{(\cot x \cot y) - 1}{\cot x + \cot y}$

$$\Rightarrow \frac{1}{\tan(x+y)} = \text{''}$$

$$\Rightarrow \frac{1 - \tan x \tan y}{\tan x + \tan y} = \text{''}$$

$$\Rightarrow \frac{1}{\tan x + \tan y} \cdot \frac{\tan x \tan y}{\tan x \tan y} = \text{''}$$

$$\Rightarrow \frac{1}{\tan x + \tan y} \cdot \frac{\frac{1}{\cot x} \frac{1}{\cot y}}{\frac{1}{\cot x} + \frac{1}{\cot y}} = \text{''}$$

$$\Rightarrow \frac{1}{\cot y + \cot x} = \frac{\cot x \cot y}{\cot y + \cot x} = \text{''}$$

$$\Rightarrow \frac{\cot x \cot y}{\cot y + \cot x} \cdot \left(\frac{1}{\cot x \cot y} \cdot \frac{\cot x \cot y}{\cot y + \cot x} \right) = \text{''}$$

$$\Rightarrow \frac{\cot x \cot y}{\cot y + \cot x} = \frac{1}{\cot y + \cot x} = \text{''}$$

$$\Rightarrow \frac{(\cot x \cot y) - 1}{\cot x + \cot y} = \text{''}$$

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Homework Problems

Verify the identity.

$$38. \cos(x + y) \cos(x - y) = \cos^2 x - \sin^2 y$$

Homework 2/12

TB pg. 539-540 #19, 21, 27, 31, 32, 33, 34, 35, 37