

Warm Up 2/12

Verify the identity.

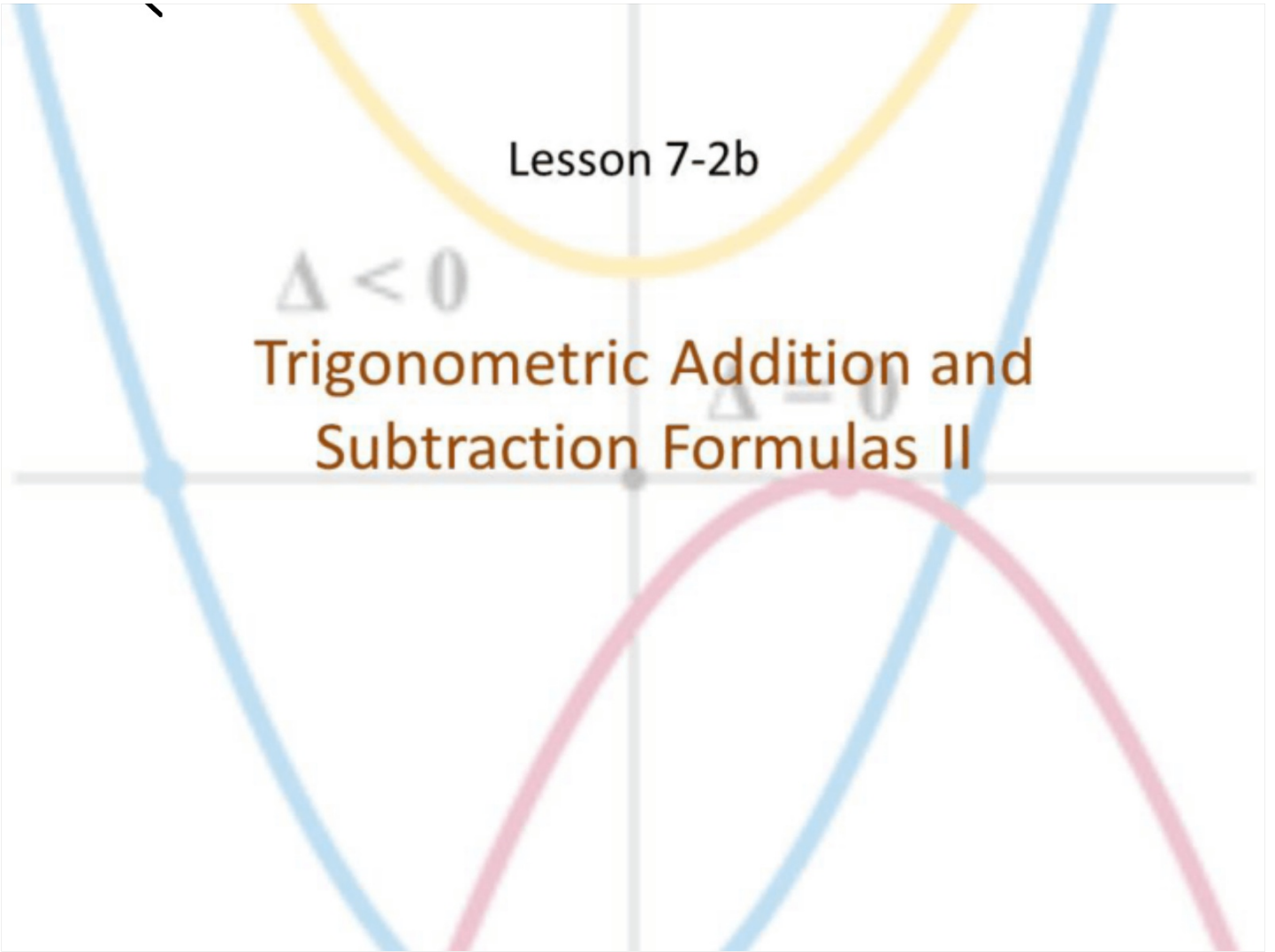
$$\frac{\sec x}{\sec x - \tan x} = \sec x (\sec x + \tan x)$$

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

$$\text{LHS: } \underbrace{\cos\frac{\pi}{2}}_0 \cos u + \underbrace{\sin\frac{\pi}{2}}_{(1)} \sin u = \sin u = \text{RHS} \quad \checkmark$$

Homework Problems

Prove the following identity:

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

$$\text{LHS: } \frac{1}{\cos\left(\frac{\pi}{2} - u\right)} = \frac{1}{\cancel{\cos\frac{\pi}{2}} \cos u + \sin\frac{\pi}{2} \sin u} = \frac{1}{\sin u} = \csc u$$

Example

Verify the following identity:

$$\frac{1+\tan x}{1-\tan x} = \tan\left(\frac{\pi}{4} + x\right)$$

$$\begin{aligned} \text{RHS: } \frac{\tan \frac{\pi}{4} + \tan x}{1 - \tan \frac{\pi}{4} \tan x} &= \frac{1 + \tan x}{1 - \cancel{1} \tan x} = \frac{1 + \tan x}{1 - \tan x} = \text{LHS} \quad \checkmark \\ &\quad \quad \quad (1) \end{aligned}$$

Homework Problems

Verify the identity.

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

$$\cos x \cos y - \cancel{\sin x \sin y} + \cos x \cos y + \cancel{\sin x \sin y}$$

$$= 2 \cos x \cos y = \text{RHS.}$$

Homework Problems

Verify the identity.

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

$$\frac{1}{\tan(x+y)} = \frac{1}{\tan x + \tan y} = \frac{1}{1 - \tan x \tan y}$$

$$\frac{\cot x \cot y - 1}{\cot x + \cot y} = \frac{1 - \tan x \tan y}{\frac{1}{\cot y} + \frac{1}{\cot x}}$$

$$= \frac{\cot x \cot y - 1}{\cot x \cot y}$$

$$\frac{\cot x \cot y - 1}{\cot x \cot y} \cdot \frac{\cot x \cot y}{\cot y + \cot x}$$

$$= \frac{\cot x \cot y - 1}{\cot x + \cot y} = \text{RHS}$$

$$\frac{\cot y + \cot x}{\cot x \cot y}$$

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