5.5. Double Angle Identities and Product - to-Sum Friday, November 3, 2017 8:04 PM & Identities and Sum - to-Product Identities.

Last time:

cos 
$$(A+B) = cosA \cdot cosB - sinA \cdot sinB$$
  
 $cos(A-B) = cosA \cdot cosB + sinA \cdot sinB$   
 $sin(A+B) = sinA \cdot cosB + cosA sinB$   
 $sin(A-B) = sinA \cdot cosB - cosA sinB$ .  
 $tan(A+B) = \frac{tanA + tanB}{1 - tanA tanB}$   
 $tan(A-B) = \frac{tanA - tanB}{1 + tanA tanB}$ 

Obj 1: Double Angle Identities.

$$con(2A) = con(A + A) = conA \cdot conA - ninA \cdot ninA$$

$$= conA - nin^2A$$

$$con(2A) = con^2A - nin^2A$$

Wednesday, November 8, 2017 9:23 AM
$$= (1 - \sin^2 A) - \sin^2 A$$

$$= 1 - \sin^2 A - \sin^2 A$$

$$= 1 - 2\sin^2 A$$

$$\cos(2A) = 1 - 2\sin^2 A$$

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

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

$$= \cos^2 A - 1 + \cos^2 A$$

$$\cos(2A) = 2\cos^2 A - 1$$

$$sin(2A) = sin(A+A) = sinAcosA + cosAsinA$$
  
=  $sinAcosA + sinAcosA$ 

$$+an(2A) = +an(A+A) = \frac{tan A + tan A}{1 - tan A + tan A}$$

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

## All the Double-Angle Identities:

$$con(2A) = con^2A - sin^2A$$
;  $con(2A) = 2 con^2A - 1$ 

$$\cos(2A) = 1 - 2\sin^2 A$$

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

$$E.x.1.$$
 Given that  $cos\theta = \frac{3}{5}$  and  $sin\theta < 0$ 

Q: Find 
$$con(20)$$
,  $sin(20)$  and  $ton(20)$ 

$$\cos(2\theta) = 2\cos^2\theta - 1$$

$$= 2\cdot\left(\frac{9}{25}\right) - 1 = \frac{18}{25} - 1 = -\frac{7}{25}$$

$$S_0, (2\theta) = -\frac{7}{25}$$

Find 
$$\sin \theta$$
.  $\sin^2 \theta + \cos^2 \theta = 1$ 

$$\sin^2\theta + \frac{9}{25} = 1$$

$$\sin^2\Theta = 1 - \frac{9}{25} = \frac{16}{25}$$

Since  $\sin \theta < 0$ , we must have  $\sin \theta = -\frac{4}{\pi}$ .

$$\sin(2\theta) = 2\sin\theta \cdot \cos\theta = 2\cdot\left(-\frac{4}{5}\right)\cdot\left(\frac{3}{5}\right)$$

$$sin(26) = -\frac{24}{25}$$

$$\tan(2\theta) = \frac{\sin(2\theta)}{\cos(2\theta)} = \frac{-\frac{24}{25}}{-\frac{7}{25}} = \frac{24}{25} \cdot \frac{25}{7} = \frac{24}{7}.$$