Sum & Difference Formulas

$$sin(A \pm B) = sinAcosB \pm cosAsinB$$

 $cos(A \pm B) = cosAcosB \mp sinAsinB$
 $tan(A \pm B) = \frac{tanA \pm tanB}{1 \mp tanAtanB}$

10.
$$tan A = \frac{1}{5} tan B = \frac{2}{3}$$
 Find AtB in degrees

a) A & B are both acute

tan(A+B) =
$$\frac{\tan A + \tan B}{1 - \tan A \tan B} = \frac{\frac{1}{5} + \frac{2}{3}}{1 - \frac{2}{15}} = 1$$

If
$$tan(A+B)=1$$
, $0 < A, B < 90$

Double Angle Formulas

$$Sin(A+A) = Sin(2A) = SinAcosA + cosA + SinA = 2sinAcosA$$
 $cos(A+A) = cos(2A) = cosAcosA - SinAsinA$
 $= cos^2A - sin^2A$
 $= 1 - 2sin^2A$

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

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

Ex7B

$$|. a) \cos |5|^{\circ} = \cos (60^{\circ} - 45^{\circ}) = \cos 60^{\circ} \cos 45^{\circ} + \sin 60^{\circ} \sin 45^{\circ} = \left(\frac{1}{2}\right)\left(\frac{5}{2}\right) + \left(\frac{5}{2}\right)\left(\frac{5}{2}\right)$$

$$= \frac{\sqrt{2}}{4} + \frac{\sqrt{6}}{4} = \frac{12 + \sqrt{6}}{4}$$

$$\cos 45^{\circ} = \frac{\sqrt{2}}{2}$$

$$\sin 45^{\circ} = \frac{\sqrt{2}}{2}$$

$$\sin 45^{\circ} = \frac{\sqrt{2}}{2}$$

c)
$$sin(20^{\circ} + 45^{\circ}) = sin120^{\circ} cos 45^{\circ} + cos 120^{\circ} sin 45^{\circ}$$

 $sin120^{\circ} = sin(180 - 120^{\circ}) = sin60^{\circ} = \frac{13}{2}$
 $cos 120^{\circ} = cos(2 \times 60^{\circ}) = 2cos^{2}60^{\circ} - 1 = 2(\frac{1}{4}) - 1 = -\frac{1}{2}$
 $\therefore sin(120^{\circ} + 45^{\circ}) = (\frac{\sqrt{3}}{2})(\frac{\sqrt{2}}{2}) + (-\frac{1}{2})(\frac{\sqrt{2}}{2}) = \frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4} = \frac{\sqrt{6} - \sqrt{2}}{4}$

Simplifying acosx + bsinx

given f(x) and g(x),

af(x) + bg(x) is a linear combination of f(x) and g(x)

let's consider linear combinations of sinx and cosx!

 $asin(x) + bcos(x) = Rsin(x+\alpha)$ Evaluate this.

acos(x) = bcos(x) = Rcos(x7d)

Rsin(xtd) = R(sinxcosa + cosxsina) = Rsinxcosa + Rcosxsina Compare coefficients.

$$\int \frac{R \sin \alpha}{R \cos \alpha} = \frac{\alpha}{R}$$

$$R^2 = \frac{\alpha^2}{\cos^2 \alpha} = \frac{\alpha^2}{1-\sin^2 \alpha}$$

$$R_{\lambda} = \frac{\sigma_{\lambda}}{1 - \frac{\rho_{\lambda}}{\rho_{\lambda}}}$$

$$R^2 - b^2 = \alpha^2$$

$$\begin{cases} a = R\cos\alpha & 0 \\ b = R\sin\alpha & 2 \end{cases} = \frac{a}{B}$$

$$\begin{cases} b = R\sin\alpha & 0 \\ \cos\alpha & -\frac{a}{B} \end{cases}$$

$$\tan \alpha = \frac{\alpha}{b}$$

$$\alpha = \tan^{-1}\left(\frac{a}{b}\right)$$

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$$R = \frac{a}{\cos \alpha} = \frac{b}{\sin \alpha}$$

$$\alpha = \tan^{-1}\left(\frac{a}{b}\right)$$

$$R = \sqrt{\alpha^2 + b^2}$$

$$R = \frac{a}{\cos \alpha} = \frac{b}{\sin \alpha} = \sqrt{\alpha^2 + b^2}$$

1.
$$5\sin\theta + 12\cos\theta = R\sin(\theta + \alpha)$$

$$R = \sqrt{5^2 + 12^2} = 13 / \tan \alpha = \frac{12}{5} /$$

2.
$$\sqrt{3} \sinh + \sqrt{6} \cos \theta = 3 \cos(\theta - \alpha)$$

$$\tan \alpha = \frac{\sqrt{3}}{\sqrt{6}}$$

$$\alpha = \tan^{-1}\left(\frac{\sqrt{3}}{\sqrt{6}}\right) = 35.3$$

3.
$$2\sin\theta - \sqrt{5}\cos\theta = -3\cos(\theta + \alpha)$$

$$\tan(-d) = \frac{2}{\sqrt{5}}$$

 $\alpha = -\tan^{-1}(\frac{2}{-\sqrt{5}}) = 41.8^{\circ}$

4. a)
$$\cos\theta - \sqrt{3}\sin\theta = R\cos(\theta + \alpha)$$

$$\tan(\alpha) = \frac{\sqrt{3}}{1}$$

$$\propto = \tan^{-1}(\sqrt{3}) = \frac{\pi}{3}$$

$$R = \sqrt{1^2 + (3)^2} = \sqrt{4} = 2$$

$$\therefore 2\omega s(o + \frac{\pi}{3})$$



