Useful Trig identities:

I1 $$\cos(A-B) = \cos A \cos B + \sin A \sin B$$

I2 $$\sin(A-B) = \sin A \cos B - \sin B \cos A$$

I3 $$\sin^2\theta + \cos^2\theta = 1$$

I1 $\Rightarrow$ $\cos(wt-\delta) = \cos(wt)\cos\delta + \sin(wt)\sin\delta$

I2 $\Rightarrow$ $\sin(wt-\delta) = -\cos(wt)\sin\delta + \sin(wt)\cos\delta$

$\rightarrow$ if we eliminate $\sin(wt)$ from these two eqns, we get

$$\boxed{\cos\delta\cos(wt-\delta) - \sin\delta\sin(wt-\delta) = \cos wt}$$

Other derived formulae

For Beats

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

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

(a) - (b) : $\cos(A-B) - \cos(A+B) = 2\sin A \sin B$

now let $u = A-B$, $v = A+B$

then $A = \frac{u+v}{2}$ $B = \frac{v-u}{2}$

I4 $$\boxed{\cos(u) - \cos(v) = 2\sin\left(\tfrac{u+v}{2}\right)\sin\left(\tfrac{v-u}{2}\right)}$$

Also by I1:

$$R\cos(wt-\delta) = [R\cos\delta]\cos(wt) + [R\sin\delta]\sin(wt)$$
$$= A\cos(wt) + B\sin(wt)$$

$\Rightarrow$ $A = R\cos\delta$, $B = R\sin\delta$

$$A^2+B^2 = R^2\cos^2\delta + R^2\sin^2\delta = R^2$$

$$\Rightarrow \begin{cases} R = \sqrt{A^2+B^2} \\ \tan\delta = \frac{B}{A} \end{cases}$$