MATH 11022: Sum/Difference Identities

$$
\begin{aligned}
\sin(x+y) &= \sin x \cos y + \cos x \sin y \\
\sin(x-y) &= \sin x \cos y - \cos x \sin y \\
\cos(x+y) &= \cos x \cos y - \sin x \sin y \\
\cos(x-y) &= \cos x \cos y + \sin x \sin y \\
\tan(x+y) &= \frac{\tan x + \tan y}{1 - \tan x \tan y} \\
\tan(x-y) &= \frac{\tan x - \tan y}{1 + \tan x \tan y}
\end{aligned}
$$

Example 1: Find the exact value of the following:

(a) $\cos 75^\circ =$

(b) $\tan 105^\circ =$

(c) $\sin \frac{13\pi}{12} =$

(d) $\sin 35^\circ \cos 25^\circ + \cos 35^\circ \sin 25^\circ =$

(e) $\cos 56^\circ \cos 11^\circ + \sin 56^\circ \sin 11^\circ =$

Example 2: If $\sin\alpha = \dfrac{3}{5}$, $\cos\beta = \dfrac{\sqrt{5}}{5}$ and α and β are first quadrant angles, find the exact value of $\sin(\alpha+\beta)$.

Example 3: If $\sin\alpha = \dfrac{1}{4}$, $\cos\beta = -\dfrac{5}{13}$, α is in Quadrant I, and β is in Quadrant II, find the exact value of $\cos(\alpha-\beta)$.