## Section 7.5

## Sum and Difference Formulas

## Sum and Difference Formulas for Cosines

$$
\begin{aligned}
& \cos (\alpha+\beta)=\cos \alpha \cos \beta-\sin \alpha \sin \beta \\
& \cos (\alpha-\beta)=\cos \alpha \cos \beta+\sin \alpha \sin \beta
\end{aligned}
$$

Sum and Difference Formulas for Sines

$$
\begin{aligned}
& \sin (\alpha+\beta)=\sin \alpha \cos \beta+\cos \alpha \sin \beta \\
& \sin (\alpha-\beta)=\sin \alpha \cos \beta-\cos \alpha \sin \beta
\end{aligned}
$$

Sum and Difference Formulas for Tangents

$$
\begin{aligned}
& \tan (\alpha+\beta)=\frac{\tan \alpha+\tan \beta}{1-\tan \alpha \tan \beta} \\
& \tan (\alpha-\beta)=\frac{\tan \alpha-\tan \beta}{1+\tan \alpha \tan \beta}
\end{aligned}
$$

$\square$
EXAMPLE Establishing an Identity
Establish the identity: $\cos \left(\frac{\pi}{2}+\theta\right)=-\sin \theta$
$\cos \frac{\pi}{2} \cos \theta-\sin \frac{\pi}{2} \sin \theta=$ $0 \cdot \cos \theta-1 \sin \theta=$

$$
-\sin \theta=
$$

$\square$
EXAMPLE
Establishing an Identity
Prove the identity: $\tan (2 \pi-\theta)=-\tan \theta$
$\frac{\tan 2 \pi-\tan \theta}{1+\tan 2 \pi \tan \theta}=$

$$
\begin{gathered}
\frac{-\tan \theta}{1}= \\
-\tan \theta=
\end{gathered}
$$

