삼각함수의 3배각 공식
(Triple Angle Formula for Trigonometric Functions)

Triple Angle Formula for Trigonometric Functions

Start End

Triple Angle Formula for Trigonometric Functions

Start End

$$\sin 3\alpha \quad =$$

Triple Angle Formula for Trigonometric Functions

Start End

$$\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$$

Triple Angle Formula for Trigonometric Functions

Start End

$$\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$$

proof

$$\cos 3\alpha =$$

Triple Angle Formula for Trigonometric Functions

Start End

$$\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$$

proof

$$\cos 3\alpha = 4\cos^3\alpha - 3\cos\alpha$$

Triple Angle Formula for Trigonometric Functions

Start End

$$\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$$

proof

$$\cos 3\alpha = 4\cos^3\alpha - 3\cos\alpha$$

proof

Triple Angle Formula for Trigonometric Functions

Triple Angle Formula for Trigonometric Functions

$$\sin 3\alpha \quad =$$

Triple Angle Formula for Trigonometric Functions

$$\sin 3\alpha = \sin(\alpha + 2\alpha)$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned} \sin 3\alpha &= \sin(\alpha + 2\alpha) \\ &= \end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned} \sin 3\alpha &= \sin(\alpha + 2\alpha) \\ &= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned}\sin 3\alpha &= \sin(\alpha + 2\alpha) \\ &= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\ &= \end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha)
\end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&=
\end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha
\end{aligned}
$$

Home Start End

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha \\
&=
\end{aligned}
$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha(1 - \sin^2\alpha)
\end{aligned}
$$

Home Start End

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha(1 - \sin^2\alpha) \\
&=
\end{aligned}
$$

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha(1 - \sin^2\alpha) \\
&= \sin\alpha - 2\sin^3\alpha + 2\sin\alpha - 2\sin^3\alpha
\end{aligned}
$$

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha(1 - \sin^2\alpha) \\
&= \sin\alpha - 2\sin^3\alpha + 2\sin\alpha - 2\sin^3\alpha \\
&=
\end{aligned}
$$

Home Start End

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha(1 - \sin^2\alpha) \\
&= \sin\alpha - 2\sin^3\alpha + 2\sin\alpha - 2\sin^3\alpha \\
&= 3\sin\alpha - 4\sin^3\alpha
\end{aligned}
$$

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha(1 - \sin^2\alpha) \\
&= \sin\alpha - 2\sin^3\alpha + 2\sin\alpha - 2\sin^3\alpha \\
&= 3\sin\alpha - 4\sin^3\alpha
\end{aligned}
$$

$$
\therefore \sin 3\alpha =
$$

$$
\begin{aligned}
\sin 3\alpha &= \sin(\alpha + 2\alpha) \\
&= \sin\alpha\cos 2\alpha + \cos\alpha\sin 2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + \cos\alpha(2\sin\alpha\cos\alpha) \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha\cos^2\alpha \\
&= \sin\alpha(1 - 2\sin^2\alpha) + 2\sin\alpha(1 - \sin^2\alpha) \\
&= \sin\alpha - 2\sin^3\alpha + 2\sin\alpha - 2\sin^3\alpha \\
&= 3\sin\alpha - 4\sin^3\alpha
\end{aligned}
$$

$$
\therefore \sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha
$$

Triple Angle Formula for Trigonometric Functions

Triple Angle Formula for Trigonometric Functions

$$\cos 3\alpha \quad =$$

Triple Angle Formula for Trigonometric Functions

$$\cos 3\alpha = \cos(\alpha + 2\alpha)$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned} \cos 3\alpha &= \cos(\alpha + 2\alpha) \\ &= \end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned}\cos 3\alpha &= \cos(\alpha + 2\alpha) \\ &= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha\end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned}\cos 3\alpha &= \cos(\alpha + 2\alpha) \\ &= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\ &= \end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned}\cos 3\alpha &= \cos(\alpha + 2\alpha) \\ &= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\ &= \cos\alpha\end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$\begin{aligned}\cos 3\alpha &= \cos(\alpha + 2\alpha) \\ &= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\ &= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha)\end{aligned}$$

Home Start End

$$\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&=
\end{aligned}$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha
\end{aligned}
$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha \\
&=
\end{aligned}
$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2(1 - \cos^2\alpha)\cos\alpha
\end{aligned}
$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2(1 - \cos^2\alpha)\cos\alpha \\
&=
\end{aligned}
$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2(1 - \cos^2\alpha)\cos\alpha \\
&= 2\cos^3\alpha - \cos\alpha - 2\cos\alpha + 2\cos^3\alpha
\end{aligned}
$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2(1 - \cos^2\alpha)\cos\alpha \\
&= 2\cos^3\alpha - \cos\alpha - 2\cos\alpha + 2\cos^3\alpha \\
&=
\end{aligned}
$$

Triple Angle Formula for Trigonometric Functions

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2(1 - \cos^2\alpha)\cos\alpha \\
&= 2\cos^3\alpha - \cos\alpha - 2\cos\alpha + 2\cos^3\alpha \\
&= 4\cos^3\alpha - 3\cos\alpha
\end{aligned}
$$

Home Start End

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2(1 - \cos^2\alpha)\cos\alpha \\
&= 2\cos^3\alpha - \cos\alpha - 2\cos\alpha + 2\cos^3\alpha \\
&= 4\cos^3\alpha - 3\cos\alpha
\end{aligned}
$$

$$
\therefore \cos 3\alpha =
$$

Home Start End

$$
\begin{aligned}
\cos 3\alpha &= \cos(\alpha + 2\alpha) \\
&= \cos\alpha\cos 2\alpha - \sin\alpha\sin 2\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - \sin\alpha(2\sin\alpha\cos\alpha) \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2\sin^2\alpha\cos\alpha \\
&= \cos\alpha(2\cos^2\alpha - 1) - 2(1 - \cos^2\alpha)\cos\alpha \\
&= 2\cos^3\alpha - \cos\alpha - 2\cos\alpha + 2\cos^3\alpha \\
&= 4\cos^3\alpha - 3\cos\alpha
\end{aligned}
$$

$$
\therefore \cos 3\alpha = 4\cos^3\alpha - 3\cos\alpha
$$

Github:
https://min7014.github.io/math20230420001.html

Click or paste URL into the URL search bar,
and you can see a picture moving.