Precalculus Double/half angle formulas, theory

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Double angle formulas

Proposition (Double angle formulas)

$$sin(2\alpha) = 2 sin \alpha cos \alpha
cos(2\alpha) = cos2 \alpha - sin2 \alpha
= 2 cos2 \alpha - 1
= 1 - 2 sin2 \alpha$$

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$$sin(2\alpha) = 2 sin \alpha cos \alpha$$

$$cos(2\alpha) = cos^2 \alpha - sin^2 \alpha$$

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

$$= 1 - 2 sin^2 \alpha$$

• The double angle formulas play a special role in integration.

Example

Derive the double-angle formulas.

$$sin(2\alpha) =$$

$$cos(2\alpha) =$$

Example

Derive the double-angle formulas.

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

$$= \sin \alpha \cos \alpha + \cos \alpha \sin \alpha$$

$$= 2\sin \alpha \cos \alpha$$

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

$$= \cos \alpha \cos \alpha - \sin \alpha \sin \alpha$$

$$= \cos^2 \alpha - \sin^2 \alpha$$

$$= \cos^2 \alpha - (1 - \cos^2 \alpha)$$

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

$$= 1 - \sin^2 \alpha - \sin^2 \alpha$$

$$= 1 - 2\sin^2 \alpha$$