6.4 Double Angle Identities

Identity: $\sin 2\theta = 2\sin\theta\cos\theta$

Simplified Form	Expanded Form
$\sin(2 \times 5)$	$2\sin(5)\cos(5)$
$\sin(2(34))$ $= \sin(68)$	$2\sin 34\cos 34$
$3\sin(2(7x))$ $= 3\sin(14x)$	$6\sin 7x\cos 7x$ $3 \cdot 2$
$7\sin 4x$ $7[\sin 2(2x)]$	$7(2\sin(2x)\cos(2x))$ $14\sin(2x)\cos(2x)$

Practice Questions:

Simplify: $10\sin 7x\cos 7x$	Expand: $20\sin 6x$
a. $20\sin 14x$ b. $5\sin 3.5x$ c. $5\sin 14x$ d. $20\sin 3.5x$	a. $10\sin 12x\cos 12x$ b. $40\sin 3x\cos 3x$ c. $40\sin 12x\cos 12x$ d. $120\sin x\cos x$

Cross-Topic Question:

What is the period and amplitude of $y = 10\sin 2x\cos 2x$

$y = 5\sin(2(2x))$
$= 5\sin 4x$

$P = \dfrac{2\pi}{4}$

$= \dfrac{\pi}{2}$

	Amp	Period
a.	10	π
b.	5	$\dfrac{\pi}{2}$
c.	20	2π
d.	5	π

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Identity: $\tan 2\theta = \dfrac{2\tan\theta}{1-\tan^2\theta} = \dfrac{\sin 2\theta}{\cos 2\theta}$

Simplified Form	Expanded Form
$\tan 36$ $\tan(2 \cdot 18)$	$\dfrac{2\tan(18)}{1-\tan^2(18)}$
$\tan 10x$ $\tan(2 \cdot 5x)$	$\dfrac{2\tan(5x)}{1-\tan^2(5x)}$
$3\tan(18x)$ $3\tan(9 \cdot 2x)$	$\dfrac{6\tan(9x)}{1-\tan^2(9x)}$
$\tan(6x)$	$\dfrac{2\tan(3x)}{1-\tan^2(3x)}$
$3\tan(16x)$	$\dfrac{6\tan(8x)}{1-\tan^2(8x)}$

Identities:

Handwritten top annotations: $= \cos^2 - (1 - \cos^2)$ $1 - \sin^2 - \sin^2$

$\cos 2\theta = \cos^2\theta - \sin^2\theta$	$\cos 2\theta = 2\cos^2\theta - 1$	$\cos 2\theta = 1 - 2\sin^2\theta$

Simplified Form	Expanded Form
$\cos 14$ $\cos(2 \cdot 7)$	$\cos^2(7) - \sin^2(7)$
$\cos 14$	$2\cos^2(7) - 1$
$\cos 14$	$1 - 2\sin(7)$
$\cos(14x)$	$\cos^2 7x - \sin^2 7x$
$\cos(2 \cdot 3x)$	$2\cos^2(3x) - 1$
$2\left[\cos(2 \cdot 5x)\right]$	$4\cos^2 5x - 2$ $2(2\cos^2 5x - 1)$
$\cos(2 \cdot 5x)$	$1 - 2\sin^2(5x)$
$\cos(2 \cdot 8x)$	$5 - 10\sin^2 8x$ $5(1 - 2\sin^2 8x)$

Practice Questions:

Simplify: $3 - 6\sin^2 10x$	Expand: $8\cos 14x$
a. $\cos 20x$	a. $8\cos^2 7x - 1$
b. $3\cos 20x$	b. $16\cos^2 7x - 1$
c. $6\cos 5x$	c. $16\cos^2 7x - 8$
d. $1.5\sin 20x$	d. $4\cos^2 28x - 2$

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