

### W3 – 4.5 Double Angle Formulas

MHF4U

Jensen

1) Express each of the following as a single trig ratio.

a)  $2 \sin(5x) \cos(5x)$

b)  $\cos^2 \theta - \sin^2 \theta$

c)  $1 - 2 \sin^2(3x)$

d)  $\frac{2 \tan(4x)}{1 - \tan^2(4x)}$

e)  $4 \sin \theta \cos \theta$

f)  $2 \cos^2 \frac{\theta}{2} - 1$

2) Express each of the following as a single trig ratio and then evaluate

a)  $2 \sin 45^\circ \cos 45^\circ$

b)  $\cos^2 30^\circ - \sin^2 30^\circ$

c)  $2 \sin \frac{\pi}{12} \cos \frac{\pi}{12}$

d)  $\cos^2 \frac{\pi}{12} - \sin^2 \frac{\pi}{12}$

e)  $1 - 2 \sin^2 \frac{3\pi}{8}$

f)  $2 \tan 60^\circ \cos^2 60^\circ$

3) Use a double angle formula to rewrite each trig ratio

a)  $\sin(4\theta)$

b)  $\cos(3x)$

c)  $\tan x$

d)  $\cos(6\theta)$

e)  $\sin x$

f)  $\tan(5\theta)$

4) Determine the values of  $\sin 2\theta$ ,  $\cos 2\theta$ , and  $\tan 2\theta$ , given  $\cos \theta = \frac{3}{5}$  and  $0 \leq \theta \leq \frac{\pi}{2}$

5) Determine the values of  $\sin 2\theta$ ,  $\cos 2\theta$ , and  $\tan 2\theta$ , given  $\tan \theta = -\frac{7}{24}$  and  $\frac{\pi}{2} \leq \theta \leq \pi$

6) Determine the values of  $\sin 2\theta$ ,  $\cos 2\theta$ , and  $\tan 2\theta$ , given  $\sin \theta = -\frac{12}{13}$  and  $\frac{3\pi}{2} \leq \theta \leq 2\pi$

7) Determine the values of  $\sin 2\theta$ ,  $\cos 2\theta$ , and  $\tan 2\theta$ , given  $\cos \theta = -\frac{4}{5}$  and  $\frac{\pi}{2} \leq \theta \leq \pi$

8) Determine the value of  $a$  in the equation  $2 \tan x - \tan(2x) + 2a = 1 - \tan(2x) \tan^2 x$

### Answer Key

1) a)  $\sin(10x)$  b)  $\cos(2\theta)$  c)  $\cos(6x)$  d)  $\tan(8x)$  e)  $2 \sin(2\theta)$  f)  $\cos \theta$

2) a)  $\sin 90^\circ$ ; 1 b)  $\cos 60^\circ$ ;  $\frac{1}{2}$  c)  $\sin \frac{\pi}{6}$ ;  $\frac{1}{2}$  d)  $\cos \frac{\pi}{6}$ ;  $\frac{\sqrt{3}}{2}$  e)  $\cos \frac{3\pi}{4}$ ;  $-\frac{1}{\sqrt{2}}$  f)  $\sin 120^\circ$ ;  $\frac{\sqrt{3}}{2}$

3) a)  $2 \sin(2\theta) \cos(2\theta)$  b)  $2 \cos^2(1.5x) - 1$  c)  $\frac{2 \tan(0.5x)}{1 - \tan^2(0.5x)}$  d)  $\cos^2(3\theta) - \sin^2(3\theta)$  e)  $2 \sin(0.5x) \cos(0.5x)$  f)  $\frac{2 \tan(2.5\theta)}{1 - \tan^2(2.5\theta)}$

4)  $\sin(2\theta) = \frac{24}{25}$ ,  $\cos(2\theta) = -\frac{7}{25}$ ,  $\tan(2\theta) = -\frac{24}{7}$

5)  $\sin(2\theta) = -\frac{336}{625}$ ,  $\cos(2\theta) = \frac{527}{625}$ ,  $\tan(2\theta) = -\frac{336}{527}$

6)  $\sin(2\theta) = -\frac{120}{169}$ ,  $\cos(2\theta) = -\frac{119}{169}$ ,  $\tan(2\theta) = \frac{120}{119}$

7)  $\sin(2\theta) = -\frac{24}{25}$ ,  $\cos(2\theta) = \frac{7}{25}$ ,  $\tan(2\theta) = -\frac{24}{7}$

8)  $a = \frac{1}{2}$