Trigonometry Worksheet: Multiple Angle Formula (1)

1. Express $\cos(3\theta)$ in terms of $\cos(\theta)$.

$$\cos(3\theta) = \cos(2\theta + \theta) = \cos 2\theta \cdot \cos\theta - \sin 2\theta \sin\theta$$

$$= (2\cos^2\theta - 1)\cos\theta - 2\sin\theta \cdot \cos\theta \cdot \sin\theta$$

$$= 2\cos^3\theta - \cos\theta - 2\cos\theta \cdot \sin^2\theta$$

$$= 2\cos^3\theta - \cos\theta - 2\cos\theta(1 - \cos^2\theta)$$

$$= \underline{4\cos^3\theta - 3\cos\theta}.$$

2. Express $\sin(3\theta)$ in terms of $\sin(\theta)$.

$$\sin(3\theta) = \sin(2\theta + \theta) = \sin 2\theta \cdot \cos\theta + \cos(2\theta)\sin\theta$$

$$= 2\sin\theta \cdot \cos\theta \cdot \cos\theta + (1 - 2\sin^2\theta) \cdot \sin\theta$$

$$= 2\sin\theta \cdot \cos^2\theta + \sin\theta - 2\sin^3\theta$$

$$= 2\sin\theta(1 - \sin^2\theta) + \sin\theta - 2\sin^3\theta$$

$$= \underline{-4\sin^3\theta + 3\sin\theta}.$$