Single Pure – Trigonometry 2

1. If $\sec\theta = 3$, find the value of $\sin 2\theta$.

Harmonic Form

1. Express $2\sin x + 3\cos x$ in the form $R\sin(x + \alpha)$ where $0° < \alpha < 90°$. $\boxed{\sqrt{13}\sin(x + 56.3)}$

2. Express $\cos x - \sin x$ in the form $R\cos(x + \alpha)$ where $0 < \alpha < \frac{\pi}{2}$. $\boxed{\sqrt{2}\cos(x + \frac{\pi}{4})}$

3. Express $3\cos 2x + 4\sin 2x$ in the form $R\cos(2x - \alpha)$ where $0° < \alpha < 90°$. $\boxed{5\cos(2x - 53.1)}$

4. Express $\sin\theta + \sqrt{3}\cos\theta$ in the form $R\sin(\theta + \alpha)$ where $0 < \alpha < \frac{\pi}{2}$. $\boxed{2\sin(\theta + \frac{\pi}{3})}$

5. Express $2\cos n\theta + \frac{1}{2}\sin n\theta$ in the form $R\cos(n\theta - \alpha)$ where $0 < \alpha < \frac{\pi}{2}$. $\boxed{\frac{\sqrt{17}}{2}\cos(n\theta - 0.245)}$

6. Express $\sqrt{3}\sin 3\theta - \cos 3\theta$ in the form $R\sin(3\theta - \alpha)$ where $0° < \alpha < 90°$. ☐

7. Solve $\cos 2\theta + 3\sin 2\theta = -1$ for $0 < \theta < 2\pi$. ☐

8. By expressing $3\sin x + 2\cos x$ in the form $R\sin(x + \alpha)$, find the maximum value of
$$3\sin x + 2\cos x$$
and the smallest positive value of x (in degrees) for which this occurs. $\boxed{\text{Max value of } \sqrt{13} \text{ when } x = 56.3°}$

9. (a) What is the maximum value of $\dfrac{8}{5 + 2\cos(\theta - 20)}$?
    (b) What is the smallest positive value of θ for which this maximum occurs?

10. (From AEA paper.) Without a calculator solve $\sin\left(\frac{\pi}{3} - \theta\right) = \frac{\cos\theta}{\sqrt{3}}$, for $0 \leqslant \theta < 2\pi$.

11. (From AEA paper.)

    (a) Use the formula for $\sin(A - B)$ to show that $\sin(90 - x) = \cos x$.
    (b) Solve for $0 < \theta < 360°$
    $$2\sin(\theta + 17) = \frac{\cos(\theta + 8)}{\cos(\theta + 17)}.$$