Trigonometric identities IB SL/HL

You will need to use the following identities in this worksheet:

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

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

$$\sin 2\theta = 2\sin\theta\cos\theta$$

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

1. Find, in degrees, the values of θ in the interval $0° \le \theta \le 360°$ for which $4\sin^2\theta - 2\sin\theta = 4\cos^2\theta - 1$.

2. a) Show that the equation $15\cos^2\theta = 13 + \sin\theta$, may be written as a quadratic equation in $\sin\theta$.

   b) Hence solve the equation, giving all values of θ such that $0° \le \theta \le 360°$.

3. a) $3\sin x + 2\cos x = 0$

   b) $\sin^2 x = \frac{1}{2}$

4. Solve the equation $2\sin^2 x = 3\cos x$ for $0 \le x \le 2\pi$, giving exact answers.

5. Given that $\sin\theta = -\frac{\sqrt{3}}{2}$ and $\cos\theta = \frac{1}{2}$,

   a) find the value of θ in radians,

   b) write down the exact value of $\tan\theta$.

6. Given that $\sin\theta = \frac{7}{25}$ and that θ is obtuse find the exact value of $\sin 2\theta$.

7. Find, in degrees, the values of θ in the interval $0° \le \theta \le 360°$ for which

   a) $\sin 2\theta = \cos\theta$

   b) $\sin 2\theta - \tan\theta = 0$

   c) $3\cos 2\theta + 2\sin^2\theta + 1 = 2\sin\theta$

8. a) Sketch the curve $y = 3\sin 2x$ for $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$.

   b) Use your graph to show the values of $3\sin x = 0$ for the domain above.

   c) Find the solutions to $3\sin x = 0$ algebraically.

Answers

1. θ = 49º, 131º, 210º, 330º

2. b) θ = 19º, 161º, 204º, 336º

3. a) x = 146º, 326º b) x = 14º, 166º

4. $x = \frac{\pi}{3}, x = \frac{5\pi}{3}$

5. a) $\frac{5\pi}{3}$ b) tan θ = $-\sqrt{3}$

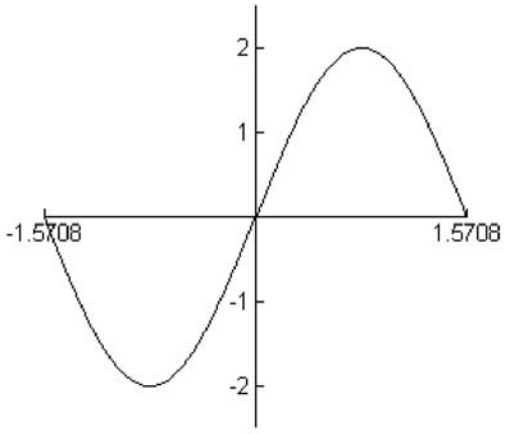
6. $\theta = \frac{336}{625}$

7. a) θ = 30º, 150º

   b) θ = 45º, 315º

   c) θ = 51º, 129º

8. a)



   b) + c) $-\frac{\pi}{2}, 0, \frac{\pi}{2}$