Old Exam Questions – Old Course

Trigonometric Equations

(C2 Winter 2005)

3. *(a)* Find all values of x in the range $0° \leqslant x \leqslant 360°$ satisfying

$$2\sin^2 x + \cos x - 1 = 0. \quad [6]$$

(b) Find all values of x in the range 0° to 180° satisfying

$$\tan 3x = 1. \quad [4]$$

(C2 Summer 2005)

2. *(a)* Find the values of x in the range $0 \leqslant x \leqslant 360°$ satisfying

$$8\cos^2 x + 2\sin x - 7 = 0. \quad [6]$$

(b) Find the values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\tan 2x = 1. \quad [3]$$

(C2 Winter 2006)

2. Find all values of θ in the interval $0° \leqslant \theta \leqslant 360°$ satisfying

(a) $4\cos^2\theta - \cos\theta = 2\sin^2\theta$, [6]

(b) $\tan\theta = -\sqrt{3}$, [2]

(c) $\sin 2\theta = \frac{1}{2}$. [3]

(C2 Summer 2006)

2. *(a)* Find all values of x between 0° and 360° satisfying

$$\tan x = -0{\cdot}4. \quad [2]$$

(b) Find all values of x between 0° and 180° satisfying

$$\cos 3x = \frac{1}{2}. \quad [4]$$

(c) Find all values of θ between 0° and 360° satisfying

$$2\cos^2\theta + 3\sin\theta = 0. \quad [5]$$

(C2 Winter 2007)

2. *(a)* Find the values of x in the range $0° \leqslant x \leqslant 360°$ satisfying

$$10 \sin^2 x - 3 \sin x = 4 \cos^2 x + 1.$$ [6]

(b) Find the values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\tan (2x + 30°) = \sqrt{3}.$$ [3]

(C2 Summer 2007)

2. *(a)* Find all values of x between 0° and 180° satisfying

$$\tan 3x = \sqrt{3}.$$ [4]

(b) Find all values of θ in the interval 0° to 360° satisfying

$$4\cos^2\theta - \cos\theta = 2\sin^2\theta.$$ [6]

(C2 Winter 2008)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$12 \sin^2 \theta - 5 \cos \theta = 9.$$ [6]

(b) Find all values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\sin (3x + 15°) = 0{\cdot}5.$$ [4]

(C2 Summer 2008)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$2\sin\theta = 3\cos\theta.$$ [3]

(b) Find all values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\cos 3x = 0{\cdot}9.$$ [4]

(c) Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$\sin^2\theta - 4\cos^2\theta = 8\sin\theta.$$ [5]

(C2 Winter 2009)

2. *(a)* Find all values of θ between 0° and 360° satisfying

$$6 \cos^2\theta + \sin\theta = 4.$$ [6]

(b) Find all values of x between 0° and 180° satisfying

$$\tan 3x = -1{\cdot}54.$$ [3]

(C2 Summer 2009)

2. *(a)* Find all values of θ between 0° and 360° satisfying

$$5\cos^2\theta + 2 = 3\sin^2\theta - 2\cos\theta. \qquad [6]$$

(b) Find all values of x between 0° and 180° satisfying

$$\sin(2x + 12°) = -0{\cdot}53. \qquad [3]$$

(C2 Winter 2010)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$3 - 7\cos\theta = 6\sin^2\theta. \qquad [5]$$

(b) Find all values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\tan(2x + 45°) = 0{\cdot}7. \qquad [3]$$

(c) Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$4\tan\theta\cos\theta + 1 = 0. \qquad [3]$$

(C2 Summer 2010)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$12\cos^2\theta - 5\sin\theta = 10. \qquad [6]$$

(b) Find all values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\tan 2x = -1{\cdot}6. \qquad [2]$$

(c) Find all values of ϕ in the range $0° \leqslant \phi \leqslant 180°$ satisfying

$$\tan\phi + 2\sin\phi = 0. \qquad [4]$$

(C2 Winter 2011)

2. *(a)* Find all values of θ between 0° and 360° satisfying

$$7\sin^2\theta + 1 = 3\cos^2\theta - \sin\theta. \qquad [6]$$

(b) Find all values of x between 0° and 180° satisfying

$$\cos(2x + 25°) = -0{\cdot}454. \qquad [3]$$

(C2 Summer 2011)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$\sin\theta + 12\cos^2\theta = 6.$$ [6]

(b) Find all values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\cos(2x - 35°) = 0{\cdot}891.$$ [3]

(c) Find all values of ϕ in the range $0° \leqslant \phi \leqslant 360°$ satisfying

$$\sin\phi + \cos\phi = 0.$$ [3]

(C2 Winter 2012)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$10\sin^2\theta + 7\cos\theta = 5\cos^2\theta + 8.$$ [6]

(b) Find all values of x in the range $0° \leqslant x \leqslant 360°$ satisfying

$$\sin(x - 50°) = -0{\cdot}682.$$ [3]

(c) Without carrying out any calculations, explain why there are no values of ϕ which satisfy the equation

$$\sin\phi + \cos\phi = 3.$$ [1]

(C2 Summer 2012)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$10\cos^2\theta + 3\cos\theta = 4\sin^2\theta - 2.$$ [6]

(b) Find all values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\sin(3x - 21°) = -0{\cdot}809.$$ [3]

(c) Find all values of ϕ in the range $0° \leqslant \phi \leqslant 360°$ satisfying

$$\cos\phi - 5\sin\phi = 0.$$ [3]

(C2 Winter 2013)

2. *(a)* Find all values of θ between 0° and 360° satisfying

$$7\sin^2\theta - \sin\theta = 3\cos^2\theta.$$ [6]

(b) Find all values of x between 0° and 180° satisfying

$$\tan(3x - 20°) = 1{\cdot}28.$$ [4]

(C2 Summer 2013)

2. *(a)* (i) Show that the equation

$$6\cos\theta + 5\tan\theta = 0$$

may be rewritten in the form

$$6\sin^2\theta - 5\sin\theta - 6 = 0.$$

(ii) Hence find all values of θ in the range $0^\circ \leqslant \theta \leqslant 360^\circ$ satisfying the equation

$$6\cos\theta + 5\tan\theta = 0.$$ [7]

(b) Find all values of x in the range $0^\circ \leqslant x \leqslant 180^\circ$ satisfying

$$\cos(2x - 60^\circ) = 0{\cdot}788.$$ [3]

(C2 Winter 2014)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$8\cos^2\theta - 7\sin^2\theta = 4\cos\theta - 3.$$ [6]

(b) The angles X, Y and Z are the three angles of a triangle. Given that $\tan X = -2{\cdot}246$ and that $\tan(Y - Z) = 0{\cdot}364$, find the values of X, Y and Z. Give each angle correct to the nearest degree. [4]

(C2 Summer 2014)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$4\cos^2\theta + 1 = 4\sin^2\theta - 2\cos\theta.$$ [6]

(b) The angle α satisfies

$$\sin(\alpha + 40°) = \frac{1}{\sqrt{2}}$$

and $$\sin(\alpha - 35°) = \frac{\sqrt{3}}{2}.$$

Given that $0° < \alpha < 180°$, find the value of α. [3]

(c) Find all values of ϕ in the range $0° \leqslant \phi \leqslant 360°$ satisfying

$$\frac{7}{\cos\phi} - \frac{10}{\sin\phi} = 0.$$ [3]

(C2 Summer 2015)

2. *(a)* Show that there is no angle θ which satisfies the equation

$$4\cos^2\theta - 2\sin^2\theta - \sin\theta + 8 = 0,$$

giving a mathematical reason to explain how you came to your conclusion. [4]

(b) Find all values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\sin(2x - 75°) = -0{\cdot}515.$$ [3]

(c) Find all values of ϕ in the range $0° \leqslant \phi \leqslant 180°$ satisfying

$$4\tan\phi + 7\sin\phi = 0.$$ [4]

(C2 Summer 2016)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$6\sin^2\theta + 1 = 2(\cos^2\theta - \sin\theta).$$ [6]

(b) Find all values of x in the range $0° \leqslant x \leqslant 180°$ satisfying

$$\tan(3x - 57°) = -0{\cdot}81.$$ [4]

(c) Without carrying out any calculations, explain why there are no values of ϕ which satisfy the equation

$$2\sin\phi + 4\cos\phi = -7.$$ [1]

(C2 Summer 2017)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$\sin^2\theta + 6\cos^2\theta + 13\sin\theta = 0.$$ [5]

(b) The angles A, B and C are the three angles of a triangle. Given that $\cos A = -0{\cdot}342$ and that $\tan(B - C) = 0{\cdot}404$, find the values of A, B and C. Give each angle correct to the nearest degree. [4]

(C2 Summer 2018)

2. *(a)* Find all values of θ in the range $0° \leqslant \theta \leqslant 360°$ satisfying

$$10\sin^2\theta + 3\sin\theta = 4\cos^2\theta - 2.$$ [6]

(b) Find all values of ϕ in the range $0° \leqslant \phi \leqslant 360°$ satisfying

$$\frac{3}{\cos\phi} - \frac{5}{\sin\phi} = 0.$$ [3]