

Old Exam Questions – Old Course  
**Sec, Cosec, Cot**

(C3 Summer 2005)

3. (a) Show, by counter-example, that the statement

$$\cot^2 \theta \equiv 1 + \operatorname{cosec}^2 \theta \quad [2]$$

is false.

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$10 \sec^2 \theta = 11 \tan \theta + 16. \quad [6]$$

(C3 Winter 2006)

2. (a) Show, by counter-example, that the statement

$$\tan 2\theta \equiv 2 \tan \theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$4 \cot^2 \theta = 11 - 4 \operatorname{cosec} \theta. \quad [6]$$

(C3 Summer 2006)

2. (a) Show, by counter-example, that the statement

$$\cos(a + b) \equiv \cos a + \cos b$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$7 - \sec^2 \theta = \tan^2 \theta + \tan \theta. \quad [6]$$

(C3 Winter 2007)

2. (a) Show, by counter-example, that the statement

$$\cos 3\theta \equiv 3 \cos^3 \theta - 4 \cos \theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$\tan^2 \theta + 2 \sec \theta = 7. \quad [6]$$

(C3 Summer 2007)

2. (a) Show, by counter-example, that the statement

$$\cos 2\theta \equiv 1 - 2\cos^2 \theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$\cot^2 \theta = 7 - 2\operatorname{cosec} \theta.$$

[6]

(C3 Winter 2008)

2. (a) Show, by counter-example, that the statement

$$\sin 3\theta \equiv 4\sin \theta - 3\sin^3 \theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$\sec \theta = 1 - 2\tan^2 \theta.$$

[6]

(C3 Summer 2008)

2. (a) Show, by counter-example, that the statement

$$\tan 2\theta \equiv \frac{2 \tan \theta}{1 + \tan^2 \theta}$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$2\sec^2 \theta = 8 - \tan \theta.$$

[6]

(C3 Winter 2009)

2. (a) Show, by counter-example, that the statement

$$\cos 2\theta \equiv 2\cos^2 \theta - \sin^2 \theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$3\tan^2 \theta = 7 + \sec \theta.$$

[6]

(C3 Summer 2009)

2. (a) Show, by counter-example, that the statement

$$\cos\theta + \cos 3\theta \equiv 2 \cos 2\theta \cos 4\theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$\cot^2\theta - 9 = \operatorname{cosec}\theta - \operatorname{cosec}^2\theta.$$

[6]

(C3 Winter 2010)

2. (a) Show, by counter-example, that the statement

$$\sin 4\theta \equiv 4 \sin^3\theta - 3 \sin\theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$3 \sec^2\theta = 7 - 11 \tan\theta.$$

Give your answers correct to one decimal place.

[6]

(C3 Summer 2010)

2. (a) Show, by counter-example, that the statement

$$\cos\theta + \cos 4\theta \equiv \cos 2\theta + \cos 3\theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$2 \tan^2\theta = \sec\theta + 8.$$

[6]

(C3 Winter 2011)

2. (a) Show, by counter-example, that the statement

$$\sec^2\theta \equiv 1 - \operatorname{cosec}^2\theta$$

is false.

[2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$3 \operatorname{cosec}^2\theta = 11 - 2 \cot\theta.$$

[6]

(C3 Summer 2011)

2. Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$2\operatorname{cosec}^2\theta + 3\cot^2\theta + 4\operatorname{cosec}\theta = 9. \quad [6]$$

(C3 Winter 2012)

2. (a) Show, by counter-example, that the statement

$$\sin(\theta + \phi) \equiv \sin\theta + \sin\phi$$

is false. [2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$\sec^2\theta + 8 = 4\tan^2\theta + 5\sec\theta. \quad [6]$$

(C3 Summer 2012)

2. (a) Show, by counter-example, that the statement

$$\text{'If } \cos\theta = \cos\phi \text{ then } \sin\theta = \sin\phi \text{'}$$

is false. [2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$13\tan^2\theta = 5\sec^2\theta + 6\tan\theta. \quad [6]$$

(C3 Winter 2013)

2. (a) (i) Show, by counter-example, that the statement

$$\cos^3\theta \equiv 1 - \sin^3\theta$$

is false.

- (ii) **Write down** a value of  $\theta$  which does satisfy the equation

$$\cos^3\theta = 1 - \sin^3\theta. \quad [3]$$

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$4\operatorname{cosec}^2\theta = 9 - 8\cot\theta. \quad [6]$$

(C3 Summer 2013)

2. (a) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$4\cot^2\theta - 8 = 2 \operatorname{cosec}^2\theta - 5 \operatorname{cosec}\theta. \quad [6]$$

- (b) Find all values of  $\phi$  in the range  $0^\circ \leq \phi \leq 360^\circ$  satisfying

$$\sec\phi + 2\tan\phi = 0. \quad [3]$$

(C3 Winter 2014)

2. (a) Show, by counter-example, that the statement

‘If  $x$  is an acute angle then  $\sin(x + 30^\circ) > \sin x$ ’

is false. [2]

- (b) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$15\operatorname{cosec}^2\theta + 2\cot\theta = 23. \quad [6]$$

(C3 Summer 2014)

2. Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$8\tan^2\theta - 5\sec^2\theta = 7 + 4\sec\theta. \quad [6]$$

(C3 Summer 2015)

2. (a) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$7 \operatorname{cosec}^2\theta - 4 \cot^2\theta = 16 + 5 \operatorname{cosec}\theta. \quad [6]$$

- (b) Without carrying out any calculations, explain why there are no values of  $\phi$  in the range  $0^\circ \leq \phi \leq 90^\circ$  which satisfy the equation

$$4 \sec\phi + 3 \operatorname{cosec}\phi = 6. \quad [1]$$

(C3 Summer 2016)

2. (a) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$3 \operatorname{cosec}\theta (\operatorname{cosec}\theta - 1) = 5 \cot^2\theta - 9. \quad [6]$$

- (b) Find all values of  $\phi$  in the range  $0^\circ \leq \phi \leq 360^\circ$  satisfying

$$2 \operatorname{cosec}\phi + 3 \sec\phi = 0. \quad [3]$$

(C3 Summer 2017)

2. (a) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$6 \tan^2 \theta - 6 = 4 \sec^2 \theta + 5 \sec \theta. \quad [6]$$

- (b) Find all values of  $\phi$  in the range  $0^\circ \leq \phi \leq 360^\circ$  satisfying

$$3 \sec \phi + 5 \tan \phi = 0. \quad [3]$$

(C3 Summer 2018)

2. (a) Find all values of  $\theta$  in the range  $0^\circ \leq \theta \leq 360^\circ$  satisfying

$$3 \operatorname{cosec}^2 \theta + 6 \cot \theta = 8 - 5 \cot^2 \theta. \quad [6]$$

- (b) Without carrying out any calculations, explain why there are no values of  $\phi$  in the range  $0^\circ \leq \phi \leq 90^\circ$  which satisfy the equation

$$\sec \phi + 2 \tan \phi = 0.8. \quad [1]$$