TRINITY COLLEGE

Year 11 Mathematics Specialist
Test 4   2019

Calculator Free
Trigonometry

STUDENT'S NAME _____

DATE: Monday 1 July   **TIME:** 35 minutes   **MARKS**: 34

INSTRUCTIONS:
Standard Items: Pens, pencils, drawing templates, eraser, scientific calculator

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

_____

1.   (1 mark)

   Simplify: $\cos^2\left(\frac{5\pi}{23}\right)+\sin^2\left(\frac{5\pi}{23}\right)$

2.   (3 marks)

   If $\sin\theta = -\frac{3}{5}$ and $\pi \leq \theta \leq \frac{3\pi}{2}$, find an expression (using fractions) for $\cos 2\theta$

3.	(10 marks)

Solve the following trigonometric equations exactly over the given domains:

(a)	$\sqrt{2}\sin(3x) = 1$ $\qquad\qquad\qquad$ $0 \le x \le \pi$ $\qquad\qquad\qquad$ [3]

(b)	$3\operatorname{cosec}^2 x - 4 = 0$ $\qquad\qquad\qquad$ $-\pi \le x \le \pi$ $\qquad\qquad\qquad$ [3]

(c)	$5\sin x - 2\cos^2 x = 1$ $\qquad\qquad\qquad$ $-2\pi \le x \le 2\pi$ $\qquad\qquad\qquad$ [4]

4.   (3 marks)

Prove: $\sin^2\theta\cot^2\theta + 2\sin^2\theta + \cos^2\theta = 2$

5.   (4 marks)

Prove the triple angle identity $\sin3x = 3\sin x - 4\sin^3 x$.

6.   (4 marks)

Prove: $(\operatorname{cosec}^2\theta - 2)(\tan^2\theta + 1) = \operatorname{cosec}^2\theta - \sec^2\theta$

7.   (5 marks)

Prove the following identity.

$1 + 2\cos2\theta + \cos4\theta = 8\cos^4\theta - 4\cos^2\theta$

8.   (4 marks)

(a)   Write the expression $4\sin\theta + 5\cos\theta$ in the form $R\sin(\theta + \alpha)$, where R is a constant and
        α is an acute angle in radians.   [2]

(b)   Use your expression above to solve algebraically the equation $4\sin\theta + 5\cos\theta = 4$
        for $-\frac{\pi}{2} \leq \theta \frac{3\pi}{2}$.   [2]