Further trigonometry - Practice test 1

Name: _____ Date: _____

10 questions | 42 marks | 65 minutes

Build from exact angles and graph features to identities and periodic applications. Angles are in radians unless a degree symbol is shown.

A scientific calculator may be used.

1. Work with radian measure. [4 marks]

(a) Convert 300° to radians. [2 marks]

(b) A sector has radius 4 cm and angle $\frac{5\pi}{3}$. Find its area. [2 marks]

2. Consider $f(x) = 2 - 3\cos(2x)$. [4 marks]

(a) State its amplitude, period and range. [2 marks]

(b) Find the first maximum at $x \geq 0$. [2 marks]

3. Solve and check the solution interval. [4 marks]

(a) Solve $\sin x = -\frac{1}{2}$ on $[0, 2\pi)$. [2 marks]

(b) Give all real solutions of $\tan(2x) = \sqrt{3}$. [2 marks]

4. Use compound-angle formulas. [4 marks]

(a) Find $\cos 15^\circ$ exactly. [2 marks]

(b) For acute A, B with $\sin A = \frac{4}{5}$ and $\cos B = \frac{5}{13}$, find $\sin(A - B)$. [2 marks]

5. Let $\tan\theta = \frac{3}{4}$ with θ acute. [4 marks]

(a) Find $\sin 2\theta$ and $\cos 2\theta$. [2 marks]

(b) Find $\tan 2\theta$. [2 marks]

6. Let $g(x) = 5 + 12\sin x + 5\cos x$. [4 marks]

(a) Express the varying part as one sine, specifying an acute phase. [2 marks]

(b) State the range of g. [2 marks]

7. Consider reciprocal trigonometry. [4 marks]

(a) Find all excluded inputs for $y = \sec(3x)$. [2 marks]

(b) Solve $\csc x = -2$ on $[0, 2\pi)$. [2 marks]

8. Prove an identity and preserve its domain. [5 marks]

(a) Show $\frac{1-\cos 2x}{1+\cos 2x} = \tan^2 x$. [3 marks]

(b) State every excluded input from the original ratio. [2 marks]

9. A model temperature is $T(t) = 18 + 6\cos(\frac{\pi(t-14)}{12})$ degrees Celsius, where t is hours after midnight. [4 marks]

(a) Find the maximum and minimum temperatures and their first occurrence in $[0, 24)$. [2 marks]

(b) Find $T(8)$ and explain one modelling assumption. [2 marks]

10. Solve an equation without dividing away a factor. [5 marks]

(a) Solve $2\sin x\cos x = \sin x$ on $[0, 2\pi)$. [3 marks]

(b) Explain what would be lost by immediately dividing by $\sin x$. [2 marks]