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VCE Mathematical Methods $\frac{3}{4}$
Circular Functions I [3.2]
Test

23.5 Marks. 1 Minute Reading. 19 Minutes Writing

Results:

Test Questions	_____ / 23.5
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Section A: Test Questions (23.5 Marks)

Question 1 (3.5 marks)

Tick whether the following statements are **true** or **false**.

	True	False
a. On the unit circle, the value of sin is represented by the y-value of the unit circle whereas the value of tan is represented by the gradient of the projection.		
b. If you change the value of x by the period in a tan function, the angle changes by 2π .		
c. In a supplementary relationship, the values of sin change to values of cos and vice versa.		
d. For a particular solution, the trigonometric equation must have a restricted domain.		
e. For a general solution, the trigonometric equation must NOT have a restricted domain.		
f. Angle θ reflected in the x -axis, y -axis and $y = x$ is given by $\frac{3\pi}{2} + \theta$.		
g. $\tan\left(\frac{7\pi}{2} + \theta\right) = -\frac{1}{\tan(\theta)}$.		

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Question 2 (5 marks)

It is known that $\cos(a) = -\frac{1}{7}$ where a is a second quadrant angle.

Evaluate the following:

a. $\cos(\pi + a)$. (1 mark)

b. $\sin(\pi + a)$. (2 marks)

c. $\sin\left(\frac{3\pi}{2} + a\right)$. (2 marks)

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Question 3 (2 marks)

State the smallest positive value of k such that $x = \frac{3\pi}{4}$ is a solution of $\tan(x) = \cos(kx)$.

$$\begin{aligned} \tan\left(\frac{3\pi}{4}\right) &= \cos\left(k \times \frac{3\pi}{4}\right) \\ -1 &= \cos\left(\frac{3k\pi}{4}\right) \end{aligned} \quad \begin{aligned} &\rightarrow \frac{3k\pi}{4} = \pi \pm 2n\pi, n \in \mathbb{Z} \\ &\therefore A + n = 0 \quad \frac{3k\pi}{4} = \pi \\ &\underline{k = \frac{4}{3}} \end{aligned}$$

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Question 4 (2 marks)

Solve $\sin\left(2x + \frac{\pi}{4}\right) = 1$ for $x \in [0, 2\pi]$.

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Question 5 (6 marks)

- a. Find the general solution to the equation below. (3 marks)

$$5 \tan \left(4x - \frac{\pi}{3} \right) + 2 = -3$$

Let $f(x) = 5 \tan \left(4x - \frac{\pi}{3} \right) + 5$ and $g(x) = 5 \tan \left(4x - \frac{\pi}{3} \right) - 5$.

- b. Find the smallest horizontal distance between any two roots of f and g . (2 marks).

c. Hence, give a general formula for the distance between any two roots of f and g . (1 mark).

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Question 6 (5 marks)

Consider the equation below:

$$-2 \sin^2\left(x + \frac{\pi}{3}\right) + 3 \cos\left(x + \frac{\pi}{3}\right) = 0$$

Evaluate the following:

- a.** Find the general solution for x . (4 marks)

[illegible]

- b.** Hence, find the values of $x \in [0, 2\pi]$ that satisfy the equation. (1 mark)



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