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VCE Mathematical Methods ½
Circular Function Exam Skills [4.3]
Homework

Admin Info & Homework Outline:

Student Name	
Questions You Need Help For	
Compulsory Questions	Pg 2 – Pg 14

Section A: Compulsory Questions

Sub-Section [4.3.1]: Equivalent General Solutions

Question 1

Which one of the following solutions is not equivalent to the others?

A. $\frac{\pi}{4} + n\pi, n \in \mathbb{Z}$

B. $-\frac{\pi}{4} + n\pi, n \in \mathbb{Z}$

C. $\frac{3\pi}{4} + n\pi, n \in \mathbb{Z}$

D. $-\frac{5\pi}{4} + n\pi, n \in \mathbb{Z}$

Question 2

Which of the following is ***not*** a general solution to the equation $\cos(x) = \frac{1}{2}$?

A. $x = \frac{5\pi}{3} + 2n\pi, n \in \mathbb{Z}$

B. $x = \frac{\pi}{3} + 2n\pi, n \in \mathbb{Z}$

C. $x = \frac{2\pi}{3} + 2n\pi, n \in \mathbb{Z}$

D. $x = -\frac{\pi}{3} + 2n\pi, n \in \mathbb{Z}$

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Question 3

Which one of the following contains all solutions to the equation $\tan(x) = 1$?

A. $x = -\frac{\pi}{4} + n\pi, n \in \mathbb{Z}$

B. $x = \frac{7\pi}{4} + n\pi, n \in \mathbb{Z}$

C. $x = -\frac{5\pi}{4} + n\pi, n \in \mathbb{Z}$

D. $x = \frac{\pi}{4} + n\pi, -\frac{3\pi}{4} + n\pi, n \in \mathbb{Z}$

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Sub-Section: Exam 1 Questions

Question 4

Given that $\cos(x) = \frac{4}{5}$ and $x \in \left(0, \frac{\pi}{2}\right)$, find:

a. $\cos(\pi - x)$.

b. $\sin\left(\frac{\pi}{2} - x\right)$.

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Question 5

Solve the following expression for x:

$$\sqrt{2}\sin\left(2x-\frac{\pi}{3}\right)=1$$

Question 6

Solve the following expression for $x \in [0,2\pi]$:

$$6\cos\left(3x-\frac{\pi}{6}\right)-3\sqrt{3}=0$$

Question 7

Solve the following expression for $x \in [0,2\pi]$:

$$2\sin^2(x) - 3\sin(x) + 1 = 0$$

Question 8

Given that $\sin(x) = \frac{5}{13}$ and $x \in \left(\frac{\pi}{2}, \pi\right)$, find $\cos(x)$.

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Question 9

Solve the following expression for x:

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

Question 10

Solve the following expression for $x \in [-\pi, \pi]$:

$$2\sin\left(x + \frac{\pi}{3}\right) = \sqrt{3}$$

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Sub-Section: Exam 2 Questions

Question 11

If $\tan(\theta) = k$ and $k \neq 0$, then $\tan\left(\frac{\pi}{2} - \theta\right)$ is equal to:

A. k

B. $-k$

C. $\frac{1}{k}$

D. $-\frac{1}{k}$

Question 12

Which one of the following represents the correct general solution for the equation $\cos(x) = -\frac{1}{2}$?

A. $x = \frac{2\pi}{3} + 2n\pi, x = \frac{5\pi}{3} + 2n\pi, n \in \mathbb{Z}$

B. $x = \frac{2\pi}{3} + 2n\pi, x = -\frac{2\pi}{3} + 2n\pi, n \in \mathbb{Z}$

C. $x = \frac{\pi}{3} + 2n\pi, x = \frac{5\pi}{3} + 2n\pi, n \in \mathbb{Z}$

D. $x = -\frac{2\pi}{3} + 2n\pi, x = \frac{\pi}{3} + 2n\pi, n \in \mathbb{Z}$

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Question 13

If $\sin(\theta) = \frac{8}{17}$ and θ is in the first quadrant, then $\cos(\theta) =$

A. $-\frac{8}{17}$.

B. $\frac{8}{17}$.

C. $-\frac{15}{17}$.

D. $\frac{15}{17}$.

Question 14

Which of the following is equivalent to $\sin\left(\frac{\pi}{2} + \theta\right)$?

A. $\cos(\theta)$

B. $-\cos(\theta)$

C. $\sin(\theta)$

D. $-\sin(\theta)$

Question 15

Which of the following is NOT a root of the function $f(x) = 2\cos^3(\theta) - \cos^2(\theta) - 2\cos(\theta) + 1$?

A. $\cos(\theta) = -\frac{1}{2}$

B. $\cos(\theta) = \frac{1}{2}$

C. $\cos(\theta) = 1$

D. $\cos(\theta) = -1$

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Question 16

On a certain trip to Woolworths, Sam's distance x, measured in metres, from the chocolate aisle at time t, measured in minutes since he entered the store, is modelled by the function:

$$x(t) = 10\cos\left(\frac{\pi t}{6}\right) + 10$$

a. State the maximum distance that Sam strays from the chocolate aisle

b. How long does it take for Sam to visit the chocolate aisle for the first time after entering Woolies?

c. After his first visit to the chocolate aisle, how much time passes before Sam visits the chocolate aisle again?

d. Hence, state a general solution that includes all of the times Sam visits the chocolate aisle.

Sam leaves the store after 36 minutes.

e. State the number of times Sam visited the chocolate aisle.

f. How much time did Sam spend within 5 metres of the chocolate aisle? Give your answer in minutes.

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Question 17

During a late night exam cram, a student tracks their energy level while drinking an energy drink. The energy level follows a predictable cycle as the caffeine levels rise and fall with every sip, modelled by the function:

$$E(t) = 5\sin\left(\pi\left(\frac{t}{2} - \frac{1}{3}\right)\right)$$

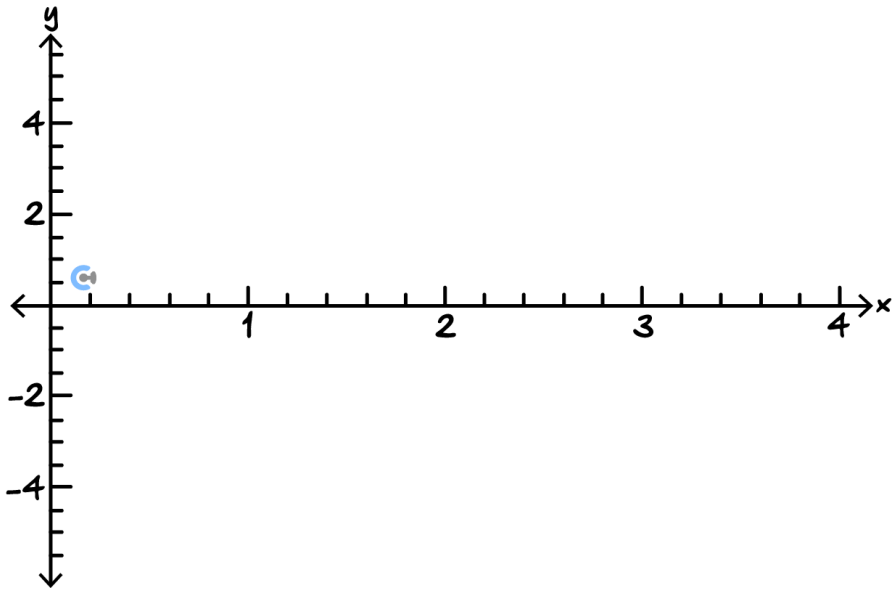
Where, E is their energy level in study productivity points (SP) at time t hours after they take their first sip of the energy drink.

a. How much energy in SP does the student have as they take their first sip of the energy drink? Give your answer correct to 2 decimal places.

b. What is the maximum energy level the student can reach before they start losing study productivity points?

c. State the period of the study productivity cycle.

d. Find the first time the student's energy level hits 0 productivity points. Give your answer in minutes



e. Find a general solution for when the student's energy level is 2.5 SP.

The student studies for 4 hours after first sipping their energy drink.

f. State the times at which the student's energy level is 2.5 SP.

g. When the student's energy level is below 0 SP, they are scrolling on Instagram Reels. Find the amount of time spent scrolling reels in the 4 hour study session. Give your answer in hours and minutes,

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