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RAFFLES INSTITUTION
RAFFLES PROGRAMME 2021
YEAR 3 MATHEMATICS
TOPIC 10: TRIGONOMETRY II (MATHS 2)

Duration: 23 mins

ASSIGNMENT 10A (Worksheets 1 & 2)

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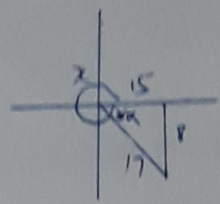
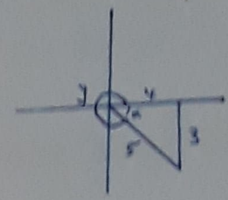
Q4

1 x and y are angles in the same quadrant such that $\sin x = -\frac{8}{17}$ and $\tan y = -\frac{3}{4}$. Find the exact value of

(i) $\operatorname{cosec} y - \tan x$, [2]

(ii) $\dfrac{\cos 510° - \sec x}{\cot y}$. [3]





(i) $\operatorname{cosec} y - \tan x = \frac{1}{\sin y} - \tan x$

$= \frac{1}{-\frac{3}{5}} + \frac{8}{15}$

$= -\frac{5}{3} + \frac{8}{15}$

$= -1\frac{2}{15}$

(ii) $\dfrac{\cos 510° - \sec x}{\cot y} = \dfrac{\cos 150° - \frac{1}{\cos x}}{\frac{1}{\tan y}}$

$= \dfrac{\cancel{\frac{\sqrt{3}}{2}} - \cos 30° - \frac{1}{\frac{15}{17}}}{\frac{1}{-\frac{3}{4}}}$

$= \dfrac{-\frac{\sqrt{3}}{2} - \frac{17}{15}}{-\frac{4}{3}}$

$= -\frac{3}{4}\left(-\frac{15\sqrt{3}}{30} - \frac{34}{30}\right)$

$= -\frac{3}{4}\left(\frac{-15\sqrt{3} - 34}{20}\right)$

$= -\frac{-15\sqrt{3} - 34}{40}$

$= \frac{15\sqrt{3} + 34}{40}$

2 It is given that $f(x) = 2\sin 2x$ and $g(x) = 3\cos\left(\frac{x}{2}\right) - 1$.

(i) Find the least and greatest value of $f(x)$ and $g(x)$. [2]

least $f(x) = 2(\cancel{0}\ -1)$
$= -2$

greatest $f(x) = 2(1)$
$= 2$

least $g(x) = 3\ \cancel{\cos}(-1) - 1$
$= -4$

greatest $g(x) = 3(1) - 1$
$= 2$

(ii) State the period of $f(x)$ and $g(x)$. [2]

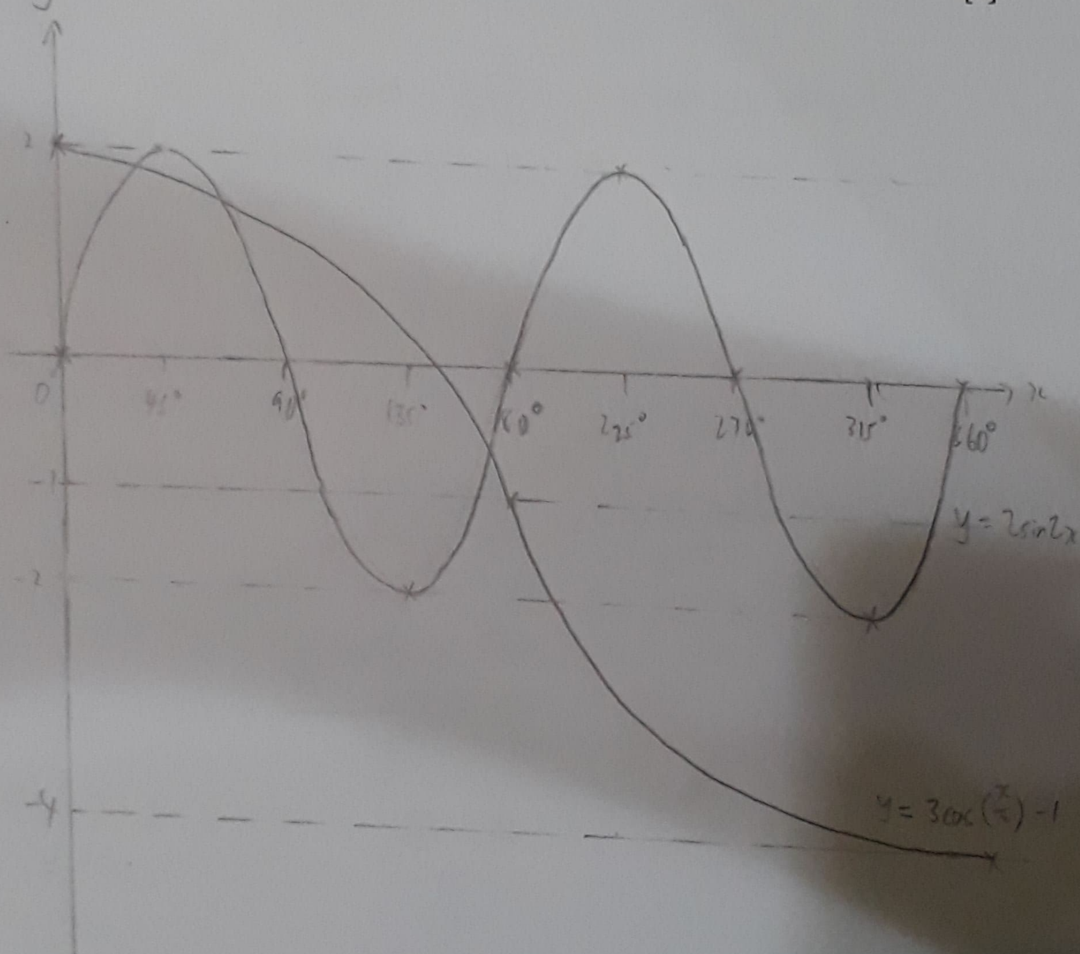
period $f(x) = \cancel{\frac{360^\circ}{2}}\ \frac{360^\circ}{2}$
$= 180^\circ$

period $g(x) = \frac{360^\circ}{\frac{1}{2}}$
$= 720^\circ$

(iii) Sketch on the same axes, the graphs of $y = f(x)$ and $y = g(x)$ for $0^\circ \le x \le 360^\circ$.

[4]

$\sin 2x$	-1	0	1
y	-2	0	2
$\cos\frac{x}{2}$	-1	0	1
y	-4	-1	2



(iv) State the number of solution/s of the eqation $2\sin 2x = 3\cos\left(\frac{x}{2}\right)$ for $0° \le x \le 360°$, giving your reason clearly.

[2]

Number of solutions = 1

This is because when the graph $y = 3\cos(\frac{x}{2}) - 1$ is moved up by $y = -1$, ~~the 2 inters~~ it does not intersect ~~2sin~~ $y = 2\sin 2x$ from $0 \le x \le 90°$, hence the number of solutions decreases by 2. Therefore number of solutions $= 3 - 2 = 1$.

*4 Find the value of the following, without the use of calculators:

$\lg(\tan 1°) + \lg(\tan 2°) + \lg(\tan 3°) + \ \dots\ + \lg(\tan 88°) + \lg(\tan 89°)$

[2]

$\lg(\tan 1°) + \lg(\tan 2°) + \lg(\tan 3°) + \dots + \lg(\tan 88°) + \lg(\tan 89°)$

$= \lg[(\tan 1°)(\tan 2°)(\tan 3°) \dots (\tan 45°) \dots (\tan 88°)(\tan 89°)]$

$\cancel{= \lg 0}$

$= \lg[(\tan 1°)(\tan 89°)(\tan 2°)(\tan 88°) \dots (\tan 44°)(\tan 46°)(\tan 45°)]$ —— 1

$(\tan x°)(\tan 90° - x°) = (\tan x°)\left(\frac{\cancel{\cos}\sin(90° - x°)}{\cos(90° - x°)}\right)$

$= (\tan x°)\left(\frac{\cos x°}{\sin x°}\right)$

$= (\tan x°)\left(\frac{1}{\frac{\sin x°}{\cos x°}}\right)$

$= \frac{\tan x°}{\tan x°}$

$= 1$

$\therefore$ Using $(\tan x°)(\tan 90° - x°) = 1$ to solve 1:

$\lg[(\tan 1°)(\tan 89°) \dots (\tan 44°)(\tan 46°)(\tan 45°)]$

$= \lg[(1)(1) \dots (1)(\tan 45°)]$

$= \lg[(1)(1) \dots (1)(1)]$

$= \lg 1$

$= 0$