Mathematics AA - IB_1

PreTest 4

`subject:` *Trigonometry I*

Wednesday 22 Jan 2025

For solving these problems, you could have to use the following trigonometric identities

$\cos^2(x)+\sin^2(x)=1$	$\sin(2x)=2\sin(x)\cos(x)$
$\text{Tan}(x)=\frac{\sin(x)}{\cos(x)}$	$\cos(2x)=\cos^2(x)-\sin^2(x)$

Problem 1 *[6 marks]*

1) What is the *exact value* of $\cos\left(\frac{\pi}{6}\right)$?

2) What relation in the frame above provides for any α an expression for $\sin(\alpha)$ in terms of $\cos(\alpha)$?

3) Assuming $\sin(\theta)=\frac{4}{5}$, give two possible values for $\cos(\theta)$ and two possible values for $\tan(\theta)$.

Problem 2 *[10 marks]*

1) Assuming θ is in the *second* sector, and $\sin(\theta)=\frac{15}{17}$, give the exact expression for

i) $\cos(\theta)$, **ii)** $\cos(2\theta)$, **iii)** $\sin(2\theta)$, **iv)** $\tan(\theta)$, **v)** $\tan(2\theta)$

2) Assuming θ is in the *third* sector, and $\tan(\theta)=\sqrt{\frac{17}{8}}$, give the exact expression for

i) $\cos(\theta)$, **ii)** $\sin(\theta)$, **iii)** $\cos(2\theta)$, **iv)** $\sin(2\theta)$, **v)** $\tan(2\theta)$

Problem 3 *[16 marks]*

Solve the following trigonometric equations: (please give all the values in rad)

1) $\cos(x)=\frac{1}{2}$ *[1 marks]*

2) $\cos(2x)=\frac{1}{2}$ *[2 marks]*

3) $\sin(x)=\frac{\sqrt{2}}{2}$ *[1 marks]*

4) $\sin(4x)=\frac{\sqrt{2}}{2}$ *[2 marks]*

5) $2\cos(x)^2-3\sin(x)=0$ *[3 marks]*

6) $6\cos x-4\sin^2 x=0$, for $0\leqslant x<3\pi$ *(radian)* *[3 marks]*

Problem 4 *(IB!!)* *[8 marks]*

Consider the trigonometric equation $3\cos(2\theta)+4\cos(\theta)+5=-1$

i) Show it can be written as

$a\cos^2(\theta)+b\cos(\theta)+c=0$ *(find a, b, c)* *[4 marks]*

ii) Hence find the solutions of this equation, for $0\leqslant x<2\pi$ (radian) *[4 marks]*