Pure Maths_3

Trigonometry

Exercise.

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Trigonometry

Q1. (i) Given that $\sin(x-60°) = 3\cos(x-45°)$, find the exact value of $\tan x$. ---[4]

(ii) Hence solve the equation $\sin(x-60°) = 3\cos(x-45°)$ for $0° < x < 360°$ ---[2]

S-18/31/Q2

Q2. Showing all necessary working, solve the equation,
$\cot\theta + \cot(\theta+45°) = 2$ for $0° < \theta < 180°$ --[5]

S-18/32/Q2

Q3. Show that $\frac{2\sin x - \sin 2x}{1-\cos 2x} = \frac{\sin x}{1+\cos x}$ --[4]

S-18/32/Q4(i)

Q4. (i) By first expanding $(\cos^2 x + \sin^2 x)^3$, or otherwise, show that,
$\cos^6 x + \sin^6 x = 1 - \frac{3}{4}\sin^2 2x$ --[4]

(ii) Hence solve the equation, --[4]
$\cos^6 x + \sin^6 x = \frac{2}{3}$ for $0° < x < 180°$

S-18/33/Q5

Q5 (i) Show that the equation $(\sqrt{2})\operatorname{cosec} x + \cot x = \sqrt{3}$ can be expressed in the form $R\sin(x-\alpha) = \sqrt{2}$, where $R > 0$ and $0 < \alpha < 90°$ --[4]

(ii) Hence solve the equation $(\sqrt{2})\operatorname{cosec} x + \cot x = \sqrt{3}$, for $0 < x < 180°$

W-18/31/Q6 ---[4]

Q6. Showing all necessary working, solve the equation, --[4]
$\sin(\theta - 30°) + \cos\theta = 2\sin\theta$, for $0° < \theta < 180°$

W-18/32/Q2

Q7. (i) Express $8\cos\theta - 15\sin\theta$ in the form $R\cos(\theta+\alpha)$, where $R > 0$, and $0° < \theta < 90°$ stating the exact value of R and giving the value of α correct to 2 decimal places. --[3]

(ii) Hence solve the equation, $8\cos 2x - 15\sin 2x = 4$, for $0° < x < 180°$. M-17/32/Q4 --[4]

Q8. (i) By first expanding $2\sin(x-30°)$, express $2\sin(x-30) - \cos x$ in the form $R\sin(x-\alpha)$, where $R > 0$ and $0° < \alpha < 90°$. Give the exact value of R and the value of α correct to 2 decimal places. --[5]

(continued →)

Trigonometry

(continued →)

Q8 (ii) Hence solve the equation,

$2\sin(x-30°) - \cos x = 1$ for $0° < x < 180°$ --[3]

S-17/31/Q8

Q9 (i) Express the equation $\cot\theta - 2\tan\theta = \sin 2\theta$, in the form $a\cos^4\theta + b\cos^2\theta + c = 0$, where a, b and c are constants to be determined. --[3]

(ii) Hence solve the equation,

$\cot\theta - 2\tan\theta = \sin 2\theta$ for $90° < \theta < 180°$ --[2]

S-17/32/Q3

Q10. Prove the identity $\frac{1+\sin\theta}{1-\sin\theta} = 2\sec^2\theta + 2\sec\theta\tan\theta - 1$ --[3]

S-17/32/Q7(ii)

Q11. Prove the identity. $\frac{\cot x - \tan x}{\cot x + \tan x} = \cos 2x$ --[3]

S-17/33/Q1

Q12. (i) Prove the identity, $\tan(45+x) + \tan(45°-x) = 2\sec 2x$ --[4]

(ii) Hence sketch the graph of $y = \tan(45°+x) + \tan(45°-x)$ for $0 \leq x \leq 90°$. W-17/31/Q4 --[3]

Q13. By expressing the equation $\tan(\theta+60°) + \tan(\theta-60°) = \cot\theta$ in terms of $\tan\theta$ only, solve the equation for $0° < \theta < 90°$ --[5]

W-17/32/Q3

Q14. Using the expansion of $\cos(3x+x)$ and $\cos(3x-x)$, show that

$\frac{1}{2}(\cos 4x + \cos 2x) = \cos 3x \cos x$ --[3]

M-18/32/Q3(i)

Trigonometry

Answers

Q1. (i) $\tan x = -\frac{(6+\sqrt{6})}{(6-\sqrt{2})}$

(ii) $118.5°$ and $298.5°$

Q2. Reduce to $3\tan^2\theta = 1$

$\therefore \theta = 30°$ and $150°$

Q3. Use double angle formula

Q4 (i) use $(a+b)^3$

(ii) $x = 20.9°, 69.1°, 110.9°, 159.1°$

Q5 (i) Rearrange $\sqrt{3}\sin x - \cos x = \sqrt{2}$

$R = 2$, $\alpha = 30°$

(ii) $x = 75°$ and $x = 165°$

Q6. Obtain $\tan\theta = \frac{1}{(4-\sqrt{3})}$

$\theta = 23.8°$

Q7 (i) $R = 17$ and $\alpha = 61.93°$

(ii) Evaluate $\cos^{-1}\left(\frac{4}{17}\right) = 76.39°$

$x = 7.2°$ and $x = 110.8°$

Q8 (i) Express $\sqrt{3}\sin x - 2\cos x$

obtain $R = \sqrt{7}$ and $\alpha = 49.11$

(ii) Get $\sin^{-1}(1/\sqrt{7}) = 22.21°$

Lever $x = 71.3°$

Q9 (i) $2\cos^4\theta + \cos^2\theta - 2 = 0$

(ii) $\theta = 152.1°$

Q10 Multiply N° and D° by $1+\sin\theta$

Q11 Express in $\sin x$ and $\cos x$

Q12 (i) use $\tan(A \pm B)$ - -

(ii) show the asymptote at $x = 45°$

Q13. Get $11\tan^2\theta = 1$

$\therefore \theta = 16.8°$

Q14. Use $\cos(A \pm B)$ formulae