Grade 12 Mathematics P2

National Senior Certificate
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Question 5 (23 Marks)
TRIGONOMETRY
Solutions in a step-by-step method

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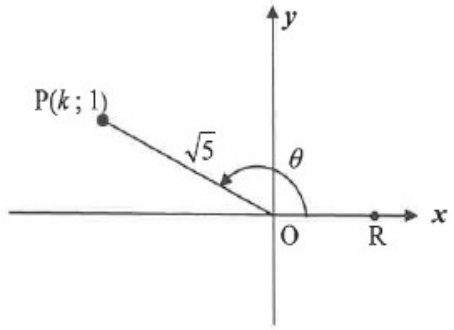
QUESTION 5

5.1 In the diagram, P(k ; 1) is a point in the 2nd quadrant and is $\sqrt{5}$ units from the origin. R is a point on the positive x-axis and obtuse $\hat{ROP} = \theta$.



5.1.1 Calculate the value of k. (2)

5.1.2 **Without using a calculator**, calculate the value of:

(a) $\tan\theta$ (1)

(b) $\cos(180° + \theta)$ (2)

(c) $\sin(\theta + 60°)$ in the form $\frac{a+b}{\sqrt{20}}$ (5)

5.1.3 **Use a calculator** to calculate the value of $\tan(2\theta - 40°)$ correct to ONE decimal place. (3)

5.2 Prove the following identity: $\frac{\cos x + \sin x}{\cos x - \sin x} - \frac{\cos x - \sin x}{\cos x + \sin x} = 2\tan 2x$ (5)

5.3 Evaluate, **without using a calculator**: $\sum_{A=38°}^{52°} \cos^2 A$ (5)

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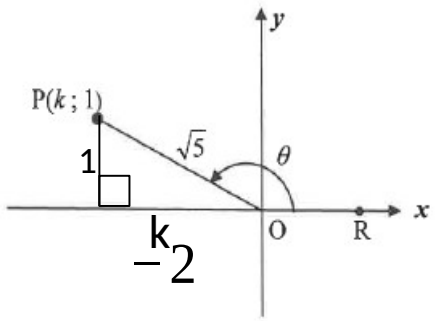

5.1.1 Calculate the value of k. (2)

5.1.1 $K^2 + 1^2 = \left(\sqrt{5}\right)^2$ *Pythagorus theorem*

$K^2 + 1 = 5$

$K^2 = 5 - 1$

$K^2 = 4$

$k = \sqrt{4}$

$k = \pm 2$

$\therefore k = -2$

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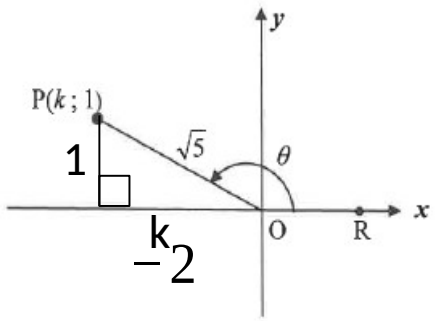

5.1.1 Calculate the value of k. (2)

5.1.2 **Without using a calculator**, calculate the value of:

(a) $\tan\theta$ (1)

(b) $\cos(180° + \theta)$ (2)

2 (a)

$$\tan\theta = \frac{Opp}{Adj}$$

$$\tan\theta = \frac{1}{k}$$

$$\tan\theta = \frac{1}{-2}$$

2 (b)

$$Cos(180^0 + \theta) \quad ¿ -Cos\theta$$

$$¿ -\frac{adj}{hyp}$$

$$¿ -\frac{-2}{\sqrt{5}}$$

$$¿ \frac{2}{\sqrt{5}}$$

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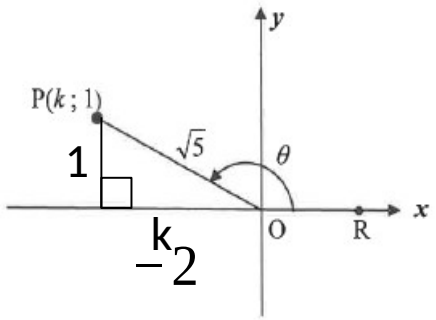

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(c) $\sin(\theta + 60°)$ in the form $\frac{a+b}{\sqrt{20}}$ (5)

2 (c) Sin

$$\sin(\theta + 60^0)$$

$$¿ \sin\theta\cos 60^0 + \cos\theta\sin 60^0$$

$$¿ \frac{1}{\sqrt{5}} \cdot \frac{1}{2} + \frac{-2}{\sqrt{5}} \cdot \frac{\sqrt{3}}{2}$$

$$¿ \frac{1}{2\sqrt{5}} + \frac{-2\sqrt{3}}{2\sqrt{5}}$$

$$¿ \frac{1 - 2\sqrt{3}}{\sqrt{20}}$$

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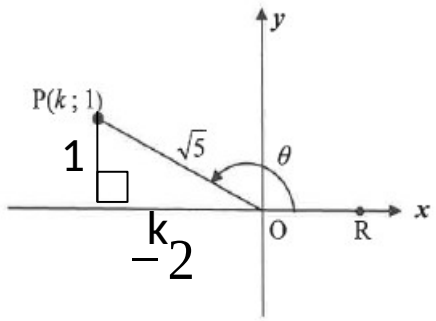


5.1.3 **Use a calculator** to calculate the value of $\tan(2\theta - 40°)$ correct to ONE decimal place. (3)

5.1.3 $\tan(2\theta - 40^0)$

Tan negative in the 2nd and 3rd Quadrants

$$\tan\theta = \frac{opp}{adj} = \frac{1}{-2}$$

$$\tan\theta = \frac{1}{-2}$$

$$\theta = \tan^{-1}\frac{1}{-2}$$

26.57^0

$$\theta = 180^0 - 26.57^0$$

$$\theta = 153.43^0$$

$\tan(2\theta - 40^0) = \tan[2(153.43^0) - 40^0]$

Quadrants where Tan is negative (remember CAST)

5.2 Prove the following identity: $\frac{\cos x+\sin x}{\cos x-\sin x}-\frac{\cos x-\sin x}{\cos x+\sin x}=2\tan 2x$ (5)

5.2 $LHS=\frac{Cosx+Sinx}{Cosx-Sinx}-\frac{Cosx-Sinx}{Cosx+Sinx}$

¿ $\frac{(Cosx+Sinx)(Cosx+Sinx)-[(Cosx-Sinx)(Cosx-Sinx)]}{(Cosx-Sinx)(Cosx+Sinx)}$

¿ $Cos^2x+2SinxCosx+Sin^2x-(Cos^2x-2CosxSinx+Sin^2x)$ ¿ $\frac{¿}{Cos^2x-Sin^2x}$

¿ $\frac{Cos^2x+2SinxCosx+Sin^2x-Cos^2x+2CosxSinx-Sin^2x}{Cos^2x-Sin^2x}$

¿ $\frac{4SinxCosx}{Cos2x}$

¿ $\frac{2.2SinxCosx}{Cos2x}$

¿ $\frac{2Sin2x}{Cos2x}$

¿ $2tan2x$ ¿ RHS

5.3 Evaluate, **without using a calculator**: $\sum_{A=38^\circ}^{52^\circ} \cos^2 A$ (5)

[23]

$$\sum_{A=38^0}^{52^0} Cos^2 A$$

$$1 + 1 + 1 + 1 + 1 + 1 + 1 + Cos^2 45^0$$

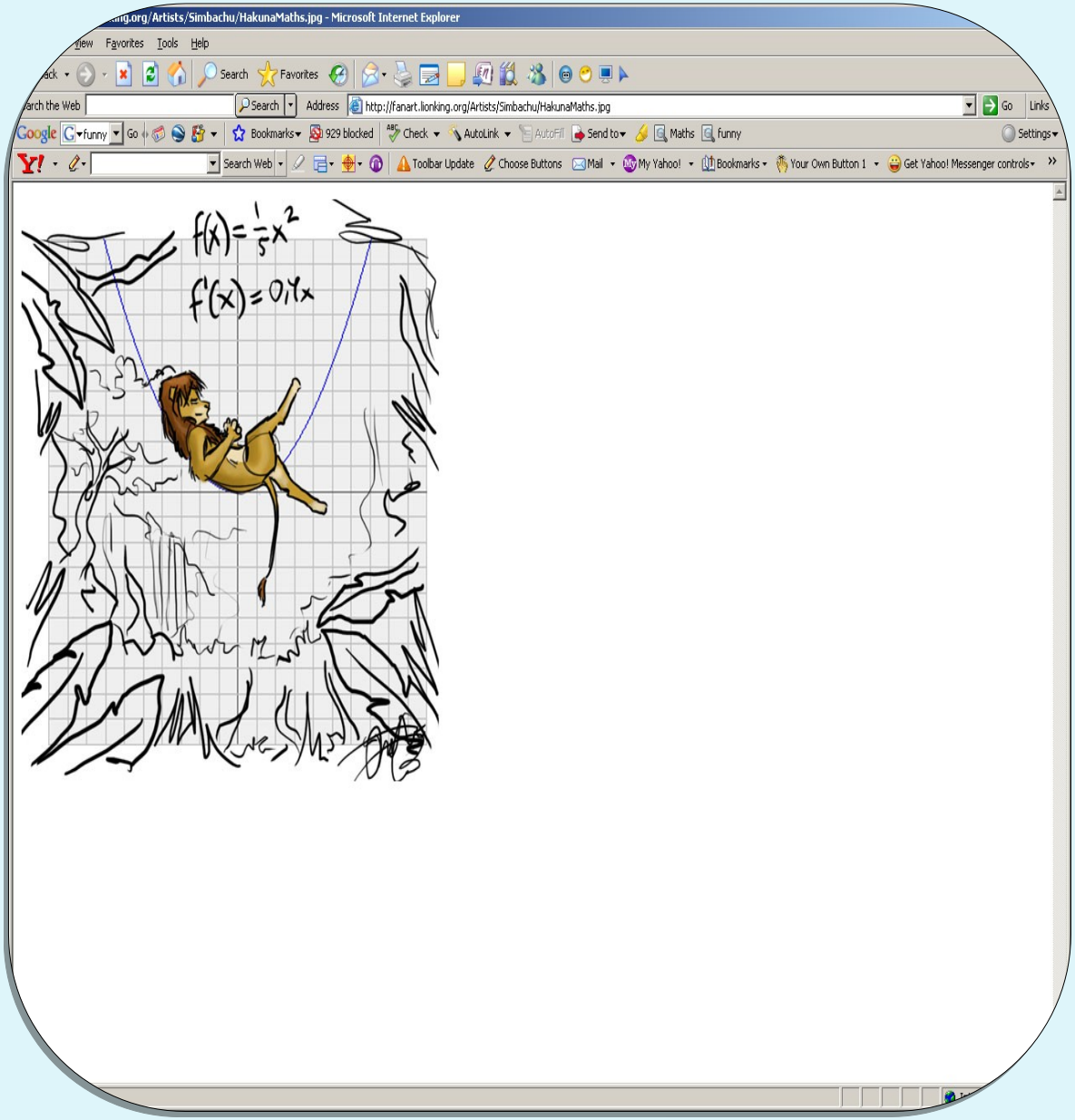
$$7(1) + Cos^2 45^0$$

$$7(1) + \left(\frac{1}{\sqrt{2}}\right)^2$$

$$7 + \frac{1}{2}$$

$$7\frac{1}{2}$$

The End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Search Web Toolbar Update Choose Buttons Mail My Yahoo! Bookmarks Your Own Button 1 Get Yahoo! Messenger controls
$f(x)=\frac{1}{5}x^2$
$f'(x)=0.4x$