#### Solutions for GCE O Level Additional Math Paper 1 & 2 - 2010

#### Paper 1:

- 1. The function f is defined by  $f(x) = x^4 x^3 + kx 4$  where k is a constant.
  - (i) Given that x 2 is a factor of f(x), find the value of k.
  - (ii) Using the value of k found in part (i), find the remainder when f(x) is divided by x + 2

[2]

#### Solution:

(i) Method 1: Rewrite

$$f(x) = x^4 - x^3 + kx - 4 =$$

$$= x^4 - 2x^3 + x^3 - 2x^2 + 2x^2 - 4x + (k+4)x$$

$$- 2(k+4) + 2(k+4) - 4$$

$$= (x-2)(x^3 + x^2 + 2x + k + 4) + 2k + 4$$

Since x-2 is a factor of  $f(x) \Rightarrow 2k+4=0 \Leftrightarrow k=-2$ Method 2:  $\therefore x-2$  is a factor of  $f(x) \Rightarrow f(2)=0 \Leftrightarrow 16-8+2k-4=0$  $\therefore k=-2$ 

(ii) Method 1: Substitute k = -2 and rewrite  $f(x) = x^4 - x^3 - 2x - 4 =$  $= x^4 + 2x^3 - (3x^3 + 6x^2) + (6x^2 + 12x)$ - (14x + 28) + 24 $= (x + 2)(x^3 - 3x^2 + 6x - 14) + 24$ 

Hence, the remainder = 24Method 2: The remainder = f(-2) = 24

- 2. (i) Show that  $(\sin x + \cos x)^2 = 1 + \sin 2x$
- (ii) Hence find, in terms of  $\pi$ , the value of  $\int_{6}^{\pi} (\sin x + \cos x)^{2} dx$

Solution:

(i)  $(\sin x + \cos x)^2 = \sin^2 x + \cos^2 x + 2\sin x \cos x = 1 + \sin 2x$ (ii) Use result from part (i):

$$\int_0^{\frac{\pi}{2}} (\sin x + \cos x)^2 dx = \int_0^{\frac{\pi}{2}} (1 + \sin 2x) dx = \left[ x - \frac{\cos 2x}{2} \right]_0^{\frac{\pi}{2}}$$
$$= \left( \frac{\pi}{2} - \frac{\cos \pi}{2} \right) - \left( 0 - \frac{\cos 0}{2} \right) = \frac{\pi}{2} + \frac{1}{2} - \left( -\frac{1}{2} \right)$$
$$= \frac{\pi}{2} + 1$$

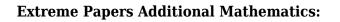
- Using a separate diagram for each part, represent on the number line the solution set of
   (i) 3(2-x) < x + 18</li>
  - (ii)  $3(x^2 5) > x 1$ [3]

State the set of values of x which satisfy both of these inequalities. [1]

Solution: (draw the graph yourself)

# **Extreme Papers Additional Mathematics**

Marcel A. Müller



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