16. At 10:00am, ship A and ship B are 16km apart. Ship A is on a bearing $N35^0E$ from ship B. Ship A is travelling at $14kmh^{-1}$ on a bearing $S29^0E$. Ship B is travelling at $17kmh^{-1}$ on a bearing $N50^0E$. Determine the;

a) velocity of ship B relative to ship A

b) closet distance between the two ships and the time when it occurs.

PURE MATHEMATICS – PAPER 1

1. Given that

$$Q = \sqrt{80 - 0.1P} \text{ and } E = \frac{-dQ}{dP} \bullet \frac{P}{Q}$$

, find E when $P = 600$

2. Find the area enclosed between the curve $y = 2x^2 - 4x$ and the xx-axis

3. Solve $2cos2\# - 5cos\# = 4$ for $0^0 \# \# \# 360^0$

4. Given that $\alpha + \beta = \frac{-1}{3}$ and $\alpha\beta = \frac{2}{3}$ form a quadratic equation whise roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$

5. Given the plane $4x + 3y - 3z - 4 = 0$;

a) show that the point A (1,1,1) lies on the plane.

b) find the perpendicular distance from the plane to the point B (1,5,1)

6. Find the equation of the tangent to the curve

$$y = \frac{a^3}{x^2} \text{ at the point } P\left(\frac{a}{t}, at^2\right)$$

7. Find the area enclosed between the curve $y = 2x^2 - 4x$ and the x-axis

8. Show that the modulus of

$$\frac{(1-i)^6}{1+i} = 4\sqrt{2}$$

9. a) Determine the perpendicular distance of the point (4,6) from the line $2x + 4y - 3 = 0$

b) Show that the angle #, between two lines with gradients $\#_1$ and $\#_2$ is given by

$$\theta = tan^{-1}\left(\frac{\lambda_1 - \lambda_2}{1 + \lambda_1\lambda_2}\right)$$

Hence find the acute angle between the lines

$$x+y+7=0 \text{ and } \sqrt{3x}-\ y+5=0$$

10. a) Given that

$$26\left(1-\frac{1}{26^2}\right)^{\frac{1}{2}}=a\sqrt{3}$$

b) Solve the simultaneous equations:

$2x = 3y = 4z,$

$x^2 - 9y^2 - 4z + 8 = 0$

11. Express *7 cos 2# + 6 sin 2#* in the form *Rcos(2 # – #), where* R is a constant and *#* is an acute angle.

Hence solve *7 cos 2# + 6 sin 2#* = 5 for 0^0# ##180^0

12. a) Given that

$$y=ln\left\{e^x\left(\frac{x-2}{x+2}\right)^{\frac{3}{4}}\right\}, \text{show that } \frac{dy}{dx}=\frac{x^2-1}{x^2-4}$$

b) Evaluate

$$\int_0^4 \frac{dx}{x^2\sqrt{(25-x^2)}}$$

13. Four points have coordinates A (3,4,7), B (13, 9, 2) , C(1,2,3) and D(10,k,6), The lines AB and CD intersect at P.Determine the;

a) vector equations of lines AB and CD

b) value of k

c) coordinates of P

14. Expand

$$\sqrt{\left(\frac{1+2x}{1-x}\right)}$$

up to the term in x^2

Hence find the value of $\sqrt{\left(\frac{1.04}{0.98}\right)}$ to four significant figures

15. a) Differentiate $y = 2x^2 + 3$ from the first principles.

b) A rectangular sheet is 50cm long and 40cm wide. A square of *x* cm of *x* cm is cut off from each corner. The remaining sheet is folded to form an open box. Find the maximum volume of the box

$$\int \frac{lnx}{x^2}\,dx$$

16. a) Find

b.) Solve the differential equation

$$\frac{dy}{dx}+\ y\cot x = x,\ \text{given that } y=1 \text{ when } x=\frac{\pi}{2}$$

END