#### **YEAR 12**

# **IARTY TEST — OCTOBER 2000**

## MATHEMATICAL METHODS — EXAMINATION 2 (ANALYSIS TASK)

#### **ANSWERS & SOLUTIONS**

#### Question 1.

- a)  $c'(t) = \cos t \sqrt{3} \sin t$
- b) Turning points when c'(t) = 0,

$$\cos t = \sqrt{3} \sin t$$
,  $\tan t = \frac{1}{\sqrt{3}}$ ,  $t = \frac{\pi}{6}, \frac{7\pi}{6}$ 

Coordinates  $(\frac{\pi}{6},2), (\frac{7\pi}{6},-2)$ 

- c)  $(0,\sqrt{3})$
- d) t intercepts occur when c(t) = 0,

$$\tan t = -\sqrt{3}, \ t = \frac{2\pi}{3}, \frac{5\pi}{3}.$$

- e) see over page. below
- $\hat{n}$  A= amplitude = 2
  - R = 1 $C = \pi/6$
- g) solving  $1 = 2\cos(t \frac{\pi}{6})$ ,

$$t=\frac{\pi}{2},\frac{11\pi}{6}.$$

#### Question 2

- a) t = 2, P = 4.84
- b)  $t = 10^{\frac{1}{15}(12-t^2)} 1$
- c)  $t = 10^{0.6} 1 = 2.98 \approx 3$  months
- d)  $10^y = x$ ,  $\log_2(10^y) = \log_2 x$
- $v \log_{10} 10 = \log_{10} x \Rightarrow result$

$$\frac{dy}{dx} = \frac{1}{x \log_e 10}$$

- $e)\frac{dP}{dt} = \frac{-15}{(1+t)\log_{1}10}$
- f) when  $t = 2, \frac{dP}{dt} = -2.17$

P is reducing by \$2170 per month after 2 months.

- g) t = 1.17
- h) t = 5.31 months
- i) Total bprofit =  $\int Pdt = 21.23$ , ie.\$21,230.

#### Question 3

- a) i) \$533.33

$$b)C = \begin{cases} \frac{8000}{n}, & n \le 20\\ 400, & 20 \le n \le 30\\ 700 - 10n, & 30 \le n \le 50 \end{cases} n \in N$$

- d)R = n(700 10n) = (x + 30)(400 10x)

 $R = 12000 + 100x - 10x^2$ 

 $e)x \in [0,20] \text{ and } x \in N$ 

$$f)\frac{dR}{dx} = 0 = 100 - 20x \Rightarrow x = 5$$

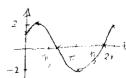
Thus 35 passengers maximises R, the receipts.

g) R contains points on a negative quadratic

function and so R achieves a maximum.

### Ouestion 4

- i) 0.067
- ii) 0.061
- iii) 0.988
- d) 108.42
- e)
- (0.871)
- ii) 0.129



(2 les)