

Free-Standing Mathematics Qualification  
June 2006  
Advanced Level



**MODELLING WITH CALCULUS**  
**Unit 12**

**6992/2PM**

**PRELIMINARY MATERIAL**

**DATA SHEET**

**To be issued to candidates between Thursday 4 May 2006 and Thursday 11 May 2006**

**REMINDER TO CANDIDATES**

**YOU MUST NOT BRING THIS DATA SHEET  
WITH YOU WHEN YOU SIT THE EXAMINATION.  
A CLEAN COPY WILL BE MADE AVAILABLE.**

## Tennis

When a ball is hit in tennis, its position can be given in terms of  $x$  and  $y$ , where

$x$  metres is the horizontal distance from  $A$ , the point at which it is hit,  
and  $y$  metres is the vertical distance from  $A$ , the point at which it is hit.

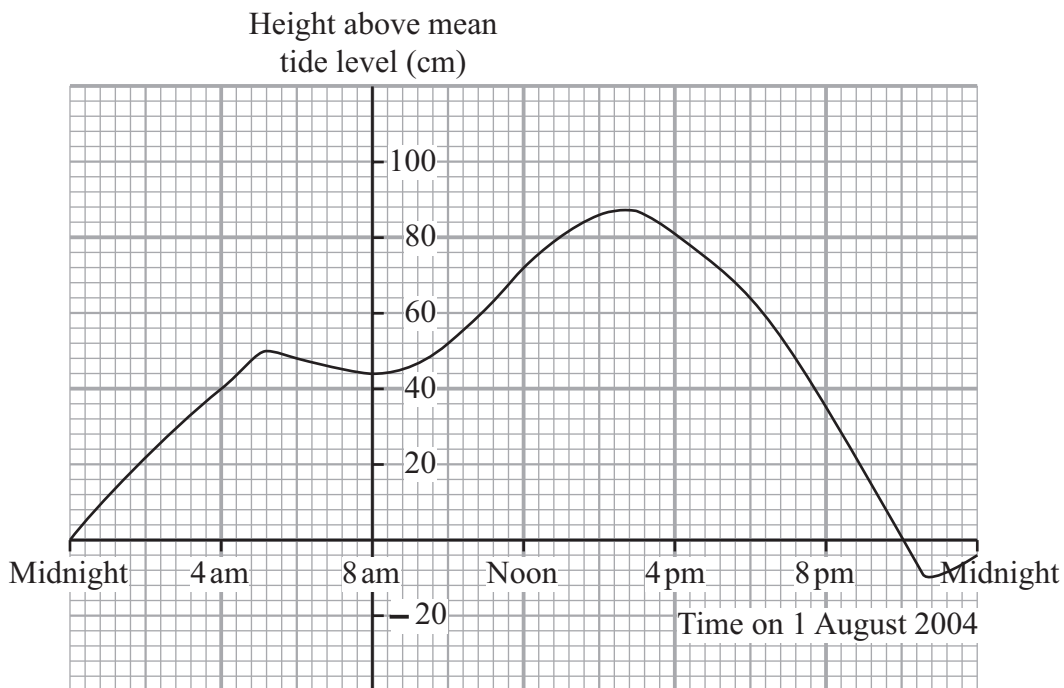
## Tides

St Petersburg, in Florida, is situated in a large bay in the Gulf of Mexico.

The tides do **not** fit the usual pattern of two high tides of roughly equal height every twenty-four-and-a-half hours.

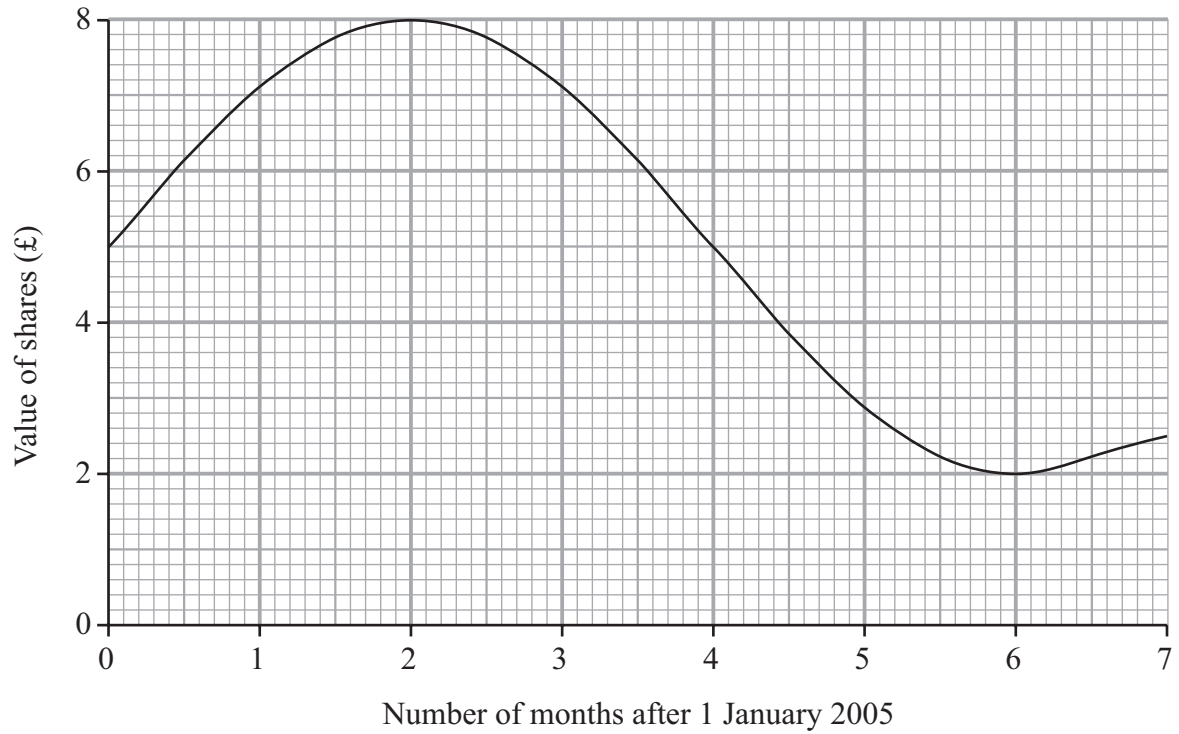
The graph below shows the height of the water above mean tide level on 1 August 2004.

The difference between the first high tide of the day at 5:15 am and the first low tide of the day at 8 am is only 0.2 feet or 6 centimetres.



**Value of Lisbon Logistics shares**

The graph below shows the value of Lisbon Logistics shares during the first seven months of the year 2005.

**Turn over ►**

**Temperature**

When a bottle of milk is taken out of a fridge, the temperature of the milk starts to rise. The rate of increase in the temperature will depend upon the milk bottle.

If  $c$  is the temperature of the milk in degrees Celsius,

and the temperature of the room is  $20^{\circ}\text{C}$ ,

then the rate of the increase in the temperature of the milk,  $\frac{dc}{dt}$ , is proportional to  $20 - c$ ,

that is to say:  $\frac{dc}{dt} \propto 20 - c$ .

**END OF DATA SHEET**