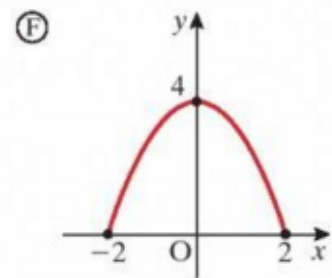
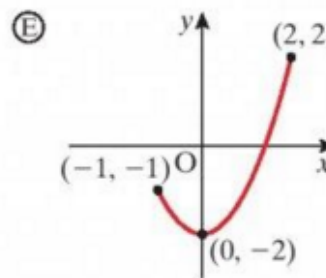
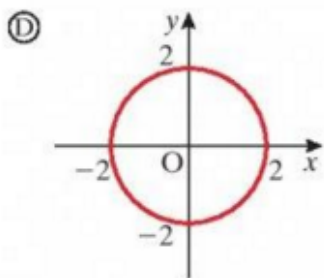
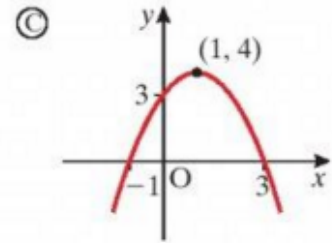
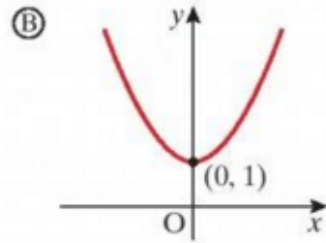
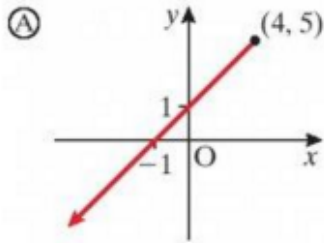


1.) The graphs and the ranges of six relations are given below.  
Connect each graph to its correct range.



Ⓚ Range =  $(-\infty, 4]$

Ⓛ Range =  $[-2, 2]$

Ⓜ Range =  $(-\infty, 2]$

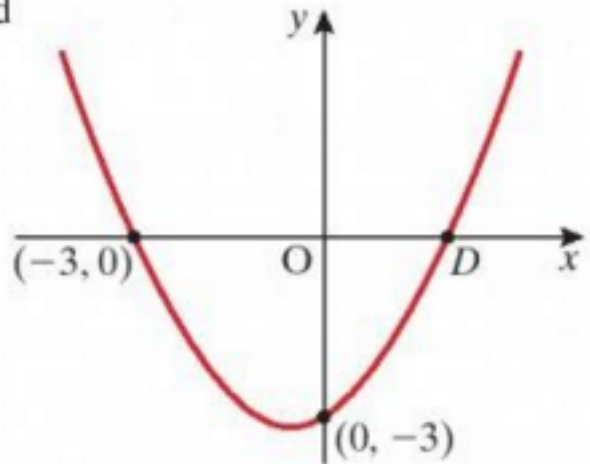
Ⓛ Range =  $[0, 4]$

Ⓟ Range =  $(-\infty, 5]$

Ⓝ Range =  $[1, \infty)$

2.) The function  $f(x) = x^2 + bx + c$  is graphed on the right.

Find b, c and D :



Grid area for working out the solution to question 2.

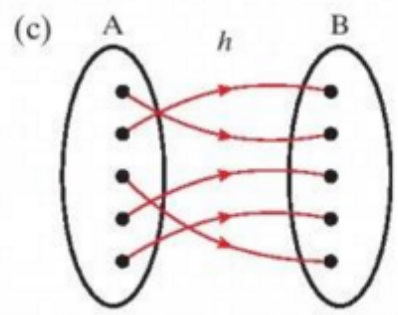
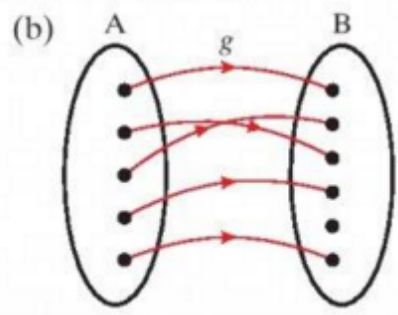
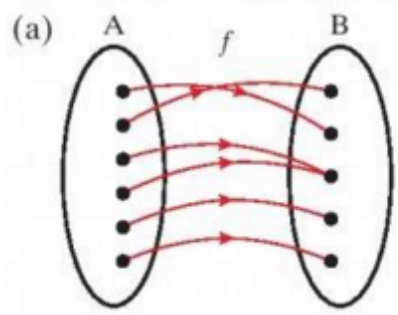


4.) (i) Find:  $\lim_{x \rightarrow 1} \frac{x^2 - 3x + 2}{x - 1}$

(ii) Find:  $\lim_{n \rightarrow \infty} \frac{2n^2 - 3n + 2}{6n^2 + 5n - 6}$

5.) Of the three mapping diagrams shown below, one is injective, one is surjective and one is bijective.

Connect each mapping to one of these descriptions.



Grid area for connecting the mappings to their descriptions.

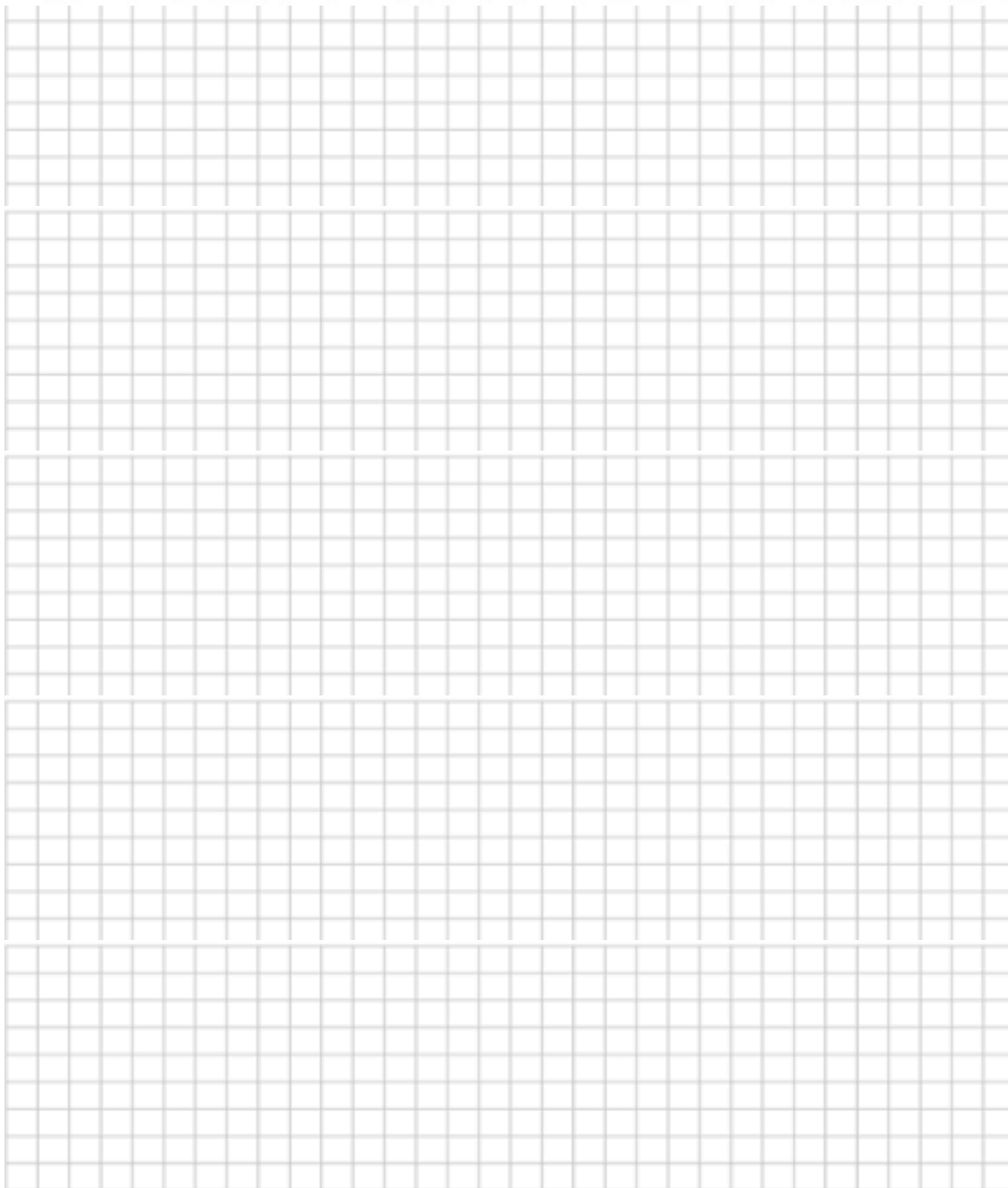
- 6.) A farmer accidentally spread a dangerous chemical on a paddock. The concentration of the chemical in the soil was initially measured at 5 kg/ha. One year later, the concentration was found to be 2.8 kg/ha.

It is known that the concentration,  $C$ , is given by

$$C = C_0 e^{-kt}$$

where  $C_0$  and  $k$  are constants, and  $t$  is measured in years.

- (i) Evaluate  $C_0$  and  $k$ .
- (ii) It is safe to use the paddock when the concentration is below 0.2 kg/ha?  
How long must the farmer wait after the accident before the paddock can be used?  
Give your answer in years, correct to one decimal place.



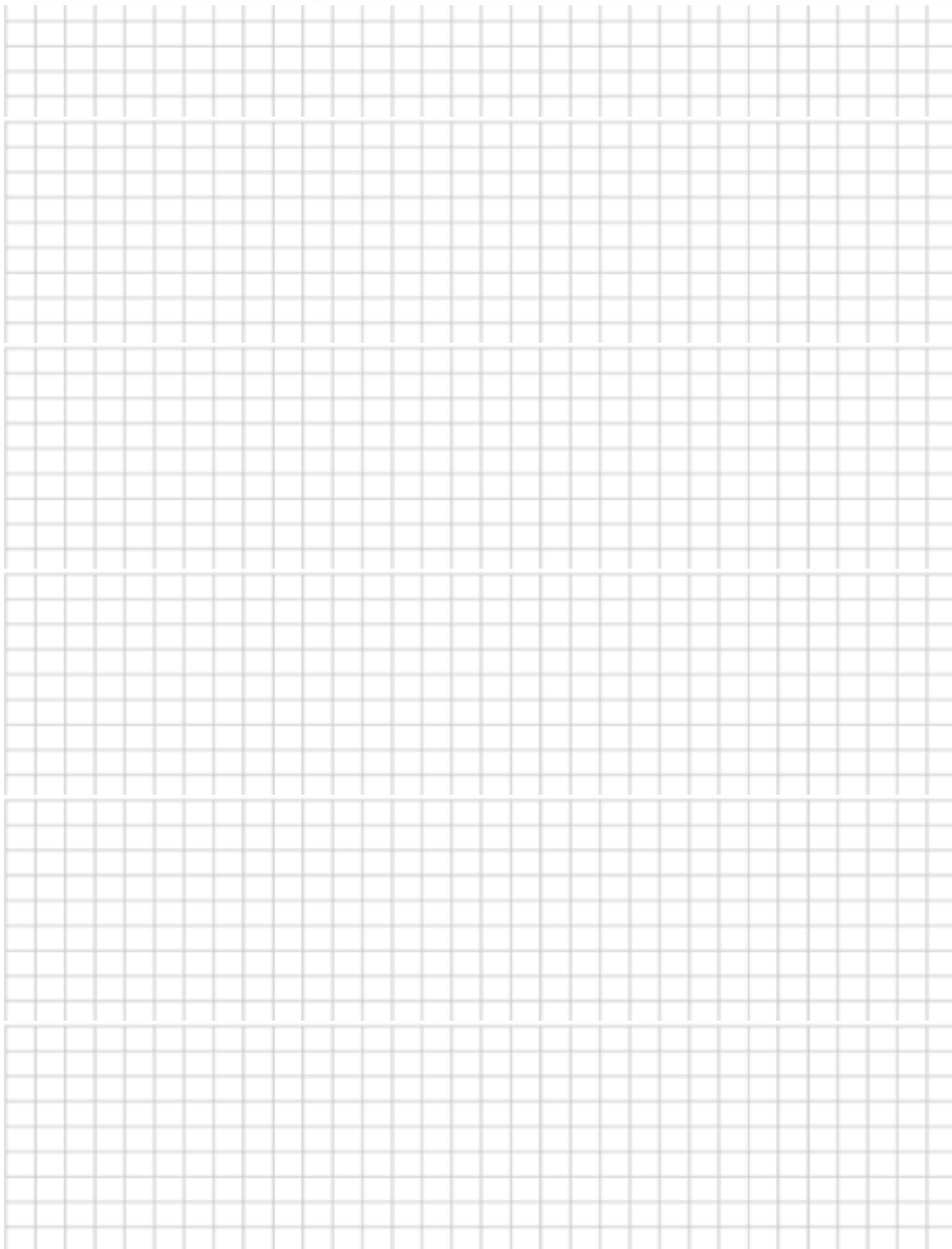
7.) The equation of a function is  $y = x^2 - 4x + 5, x \in \mathbb{R}$ .

(a) Express  $x^2 - 4x + 5$  in the form  $(x + h)^2 + k$ , where  $h, k \in \mathbb{Z}$ .

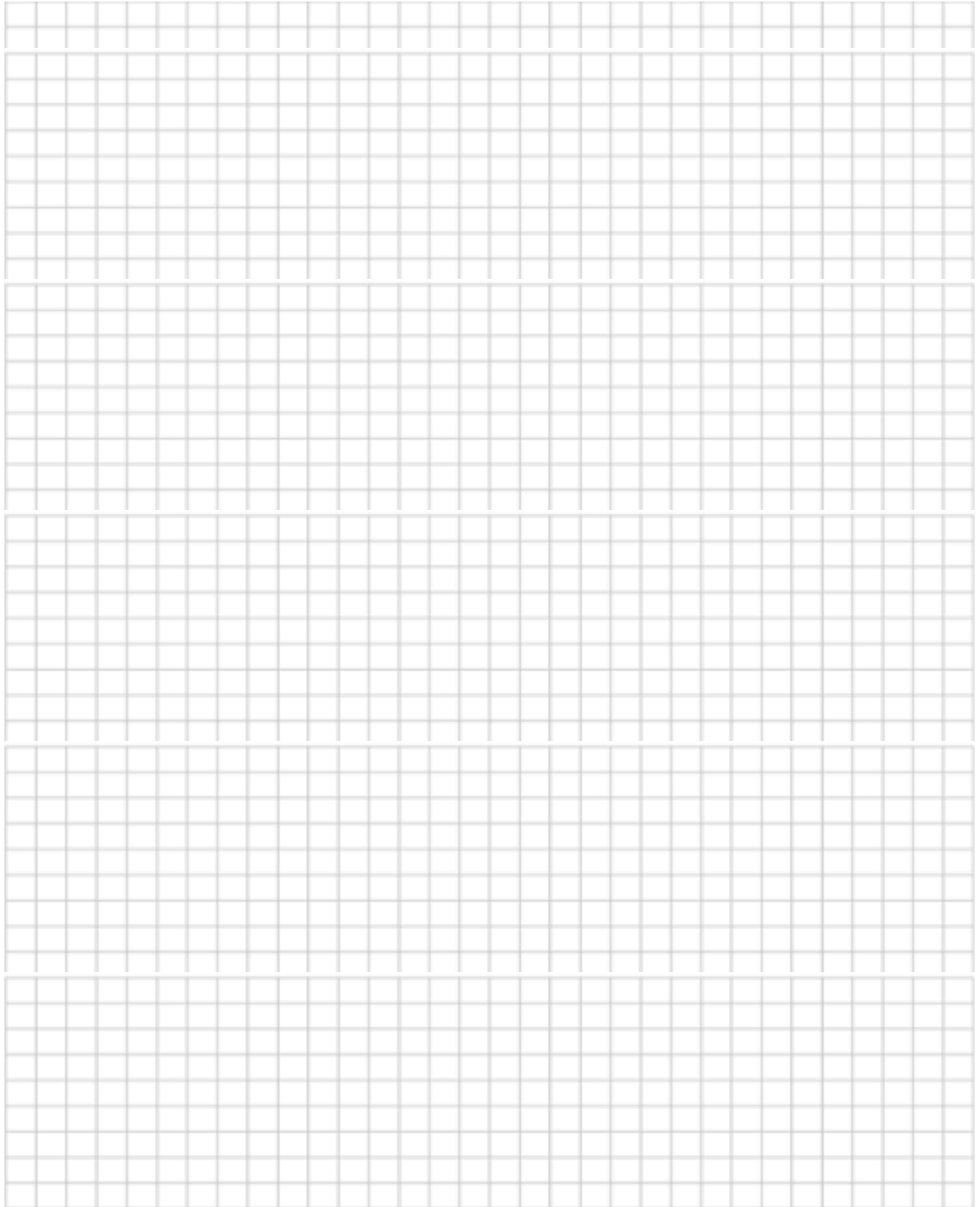
Hence, write down the coordinates of the turning point of the function and draw a rough sketch of the graph.

(b) Use the result in (a) to find the inverse function of  $y = x^2 - 4x + 5$ .

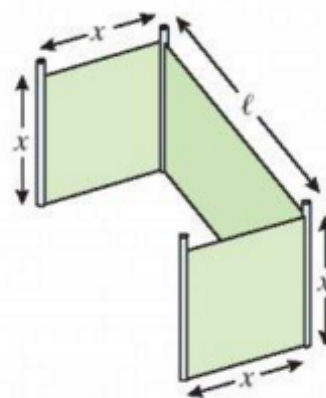
(c) Using the inverse function found in part (b), or otherwise, add a sketch of this inverse function to the sketch drawn in (a) above.



- 8.) (a) Find the values of  $a$  and  $b$  such that the graph of  $y = a \log_2(x - b)$  passes through the points  $(5, 2)$  and  $(7, 4)$ .
- (b) Which one of the following statements is not true of the graph of the function  $f: R^+ \rightarrow R, f(x) = \log_5 x$ ?
- (i) The domain is  $R^+$ .
  - (ii) The range is  $R$ .
  - (iii) It passes through the point  $(5, 0)$ .
  - (iv) It has a vertical asymptote with equation  $x = 0$ .
  - (v) The slope of the tangent at any point on the graph is positive.



- 9.) A canvas wind-shelter has two square ends, each of side  $x$  metres, and a rectangular back of length  $\ell$  metres. The area of canvas is  $9 \text{ m}^2$ .



- (i) Show that  $\ell = \frac{9}{x} - 2x$ , and hence show that the enclosed volume,  $V \text{ m}^3$ , is  $9x - 2x^3$ .
- (ii) Plot the graph of  $V$  against  $x$  for  $0 \leq x \leq 3$ .
- (iii) (a) Use your graph to find the value of  $x$  that gives the largest possible volume.  
(b) From your graph, what is this largest volume?

10.) The slope of a function  $y = f(x)$  is given by  $\text{slope} = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ .

Find the slope of each of these functions:

(i)  $f(x) = 2x - 3$

(ii)  $f(x) = x^2$

(iii)  $f(x) = x^2 + 5$

