O level E-Math Functions and graph practice questions

4048 SEAB syllabus

Topic/Sub-topics		Content

N6	Functions and graphs	• Cartesian coordinates in two dimensions
		• graph of a set of ordered pairs as a representation of a relationship between two variables
		• linear functions ($y = ax + b$) and quadratic functions ($y = ax^2 + bx + c$)
		• graphs of linear functions
		• the gradient of a linear graph as the ratio of the vertical change to the horizontal change (positive and negative gradients)
		• graphs of quadratic functions and their properties:
		   ∗ positive or negative coefficient of x^2
		   ∗ maximum and minimum points
		   ∗ symmetry
		• sketching the graphs of quadratic functions given in the form:
		   ∗ $y = (x - p)^2 + q$
		   ∗ $y = -(x - p)^2 + q$
		   ∗ $y = (x - a)(x - b)$
		   ∗ $y = -(x - a)(x - b)$
		• graphs of power functions of the form $y = ax^n$, where $n = -2, -1, 0, 1, 2, 3$, and simple sums of not more than three of these
		• graphs of exponential functions $y = ka^x$, where a is a positive integer
		• estimation of the gradient of a curve by drawing a tangent

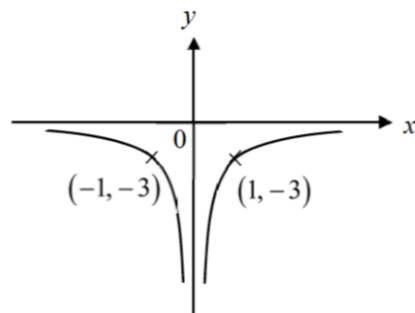# N6 Functions and graph

Question 1

Write down a possible equation for each of the graphs shown below.

(a)

$(-1, 2)$ $(1, 4)$

Answer .... [1]

(b)

$(-1, -3)$ $(1, -3)$
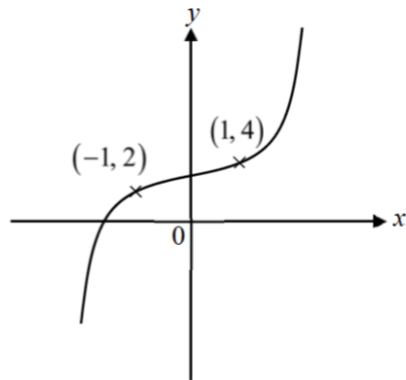
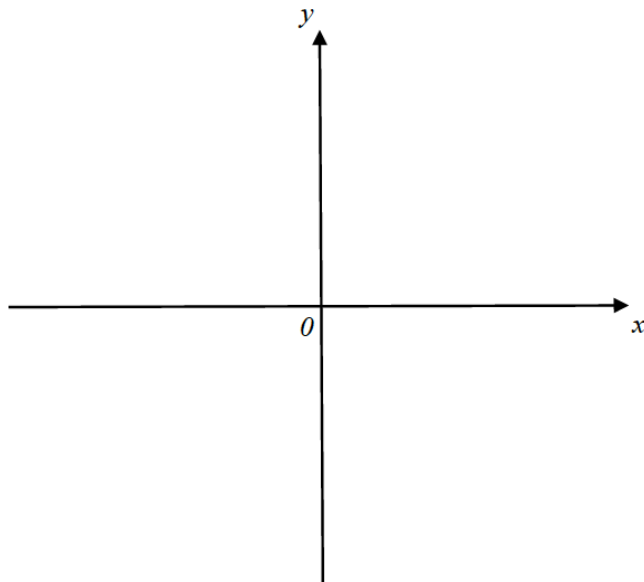*Answer* .... [1]

Question 2

(a) Express $6x + x^2 + 15$ in the form of $a + (x+b)^2$.

Answer ………………….. [2]

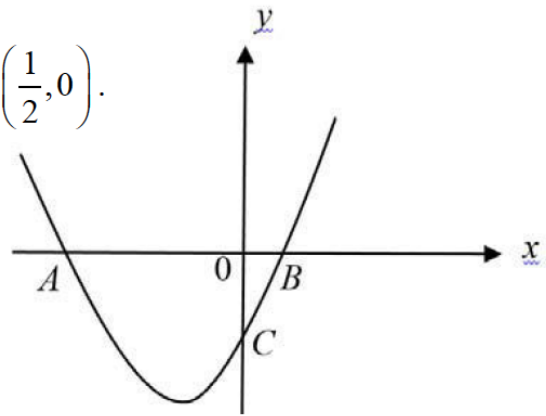(b) Hence sketch the graph of $y = 6x + x^2 + 15$.

[2]

Question 3

The diagram shows part of the graph of $5(y+3) = ax^2 + bx$, where a and b are constants.

The graph cuts the x-axis at $A\left(-2\frac{1}{2},0\right)$ and $B\left(\frac{1}{2},0\right)$.
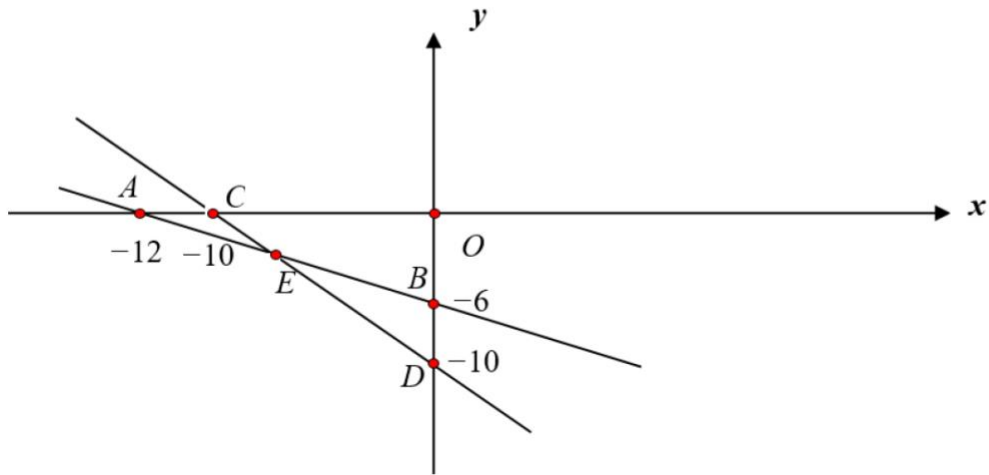
The graph meets the y-axis at the point C.
Find
(i) the value of a and of b,
(ii) the coordinates of C,
(iii) the coordinates of the minimum point,
(iv) the equation of the line of symmetry,
(v) the area of triangle ABC.

Question 4

In the figure below, the x-intercept and y-intercept of the line AB are -12 and -6 respectively. Both the x-intercept and y-intercept of the line CD are -10.
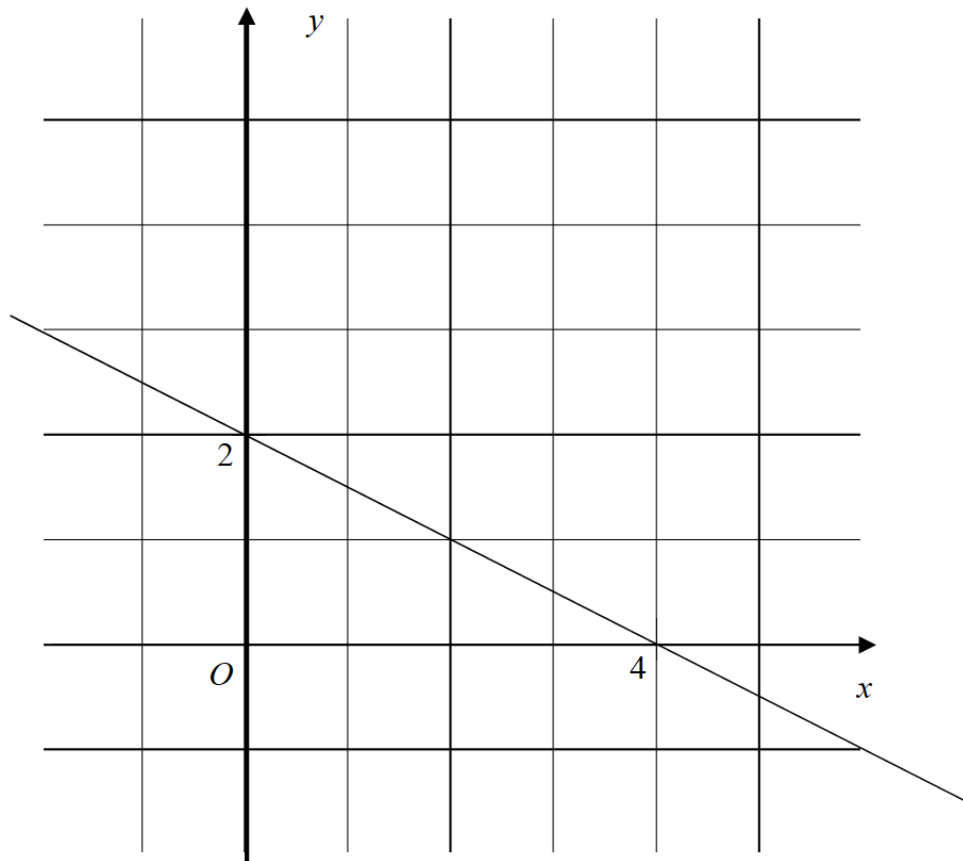

Find

(a)   the equation of the line AB and CD,   [2]

(b)   the coordinates of E,   [2]

(c)   the area of $OCEB$,   [2]

(d)   the coordinates of F given that point F lies on AB produced such that AF: $FB = 5 : 3$,   [2]

(e)   find the coordinates of point G where G is the point on the x – axis such that OE is parallel to GD.   [2]

Question 5

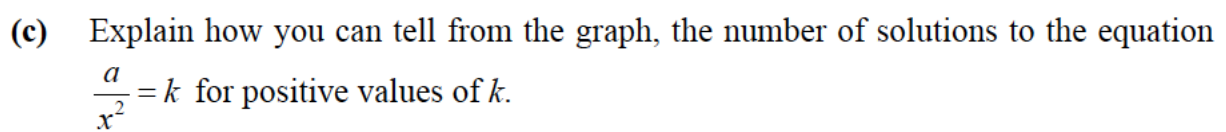The diagram shows the line $y = -\dfrac{1}{2}x + 2$.

The line $y = -\dfrac{1}{2}x + 2$ undergoes a translation represented by the vector $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$.

Draw the line after translation, on the diagram above.

[1]

Question 6

The point $(-2, 1)$ lies on the graph $y = \dfrac{a}{x^2}$.

(a)   Find the value of a.

<div align="right">

Answer $a =$ ……..……………..…… [1]

</div>

(b)   Hence, sketch the graph of $y = \dfrac{a}{x^2}$ on the axes below.

[1]

(c)   Explain how you can tell from the graph, the number of solutions to the equation $\dfrac{a}{x^2} = k$ for positive values of k.
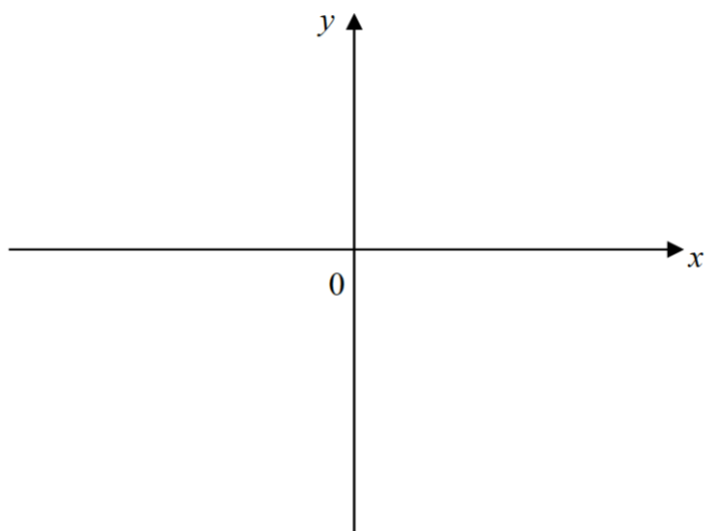
<u>Question 7</u>

(a) Express $-x^2 + 4x - 5$ in the form of $a(x+h)^2 + k$.

Answer : (a) ……………………………….. [2]

(b) **Hence**, sketch the graph of $y = -x^2 + 4x - 5$ on the axes below. Indicate clearly the turning point, the values where the graph crosses the x- and y- axes (if any).
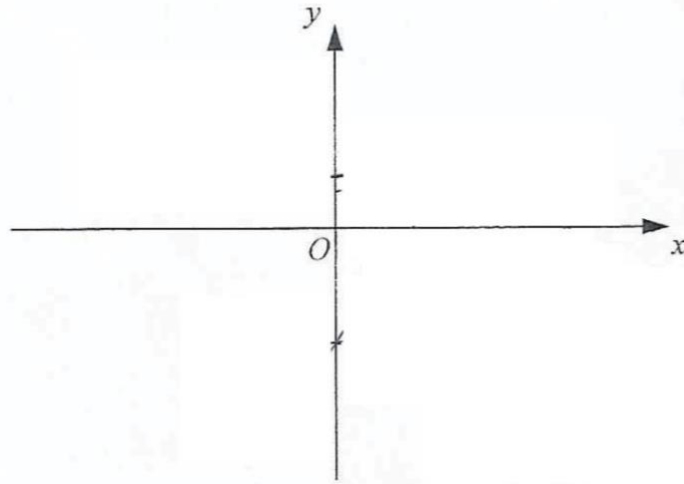
Answer : (b) [2]

(c) **Hence**, explain why the equation $-x^2 + 4x - 5 = 0$ has no solution.

Question 8

Sketch the graph of $y = -(2-x)^2 + 1$ on the axes below.

Indicate clearly the values where the graph crosses the x- and y-axes and the coordinates of any turning points.
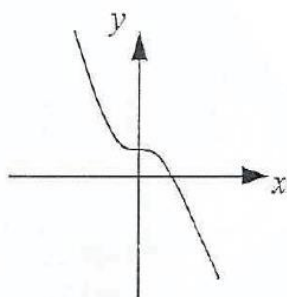

[2]

Question 9

(a) Write down a possible equation for each of the sketch graphs below. In each case select one of the equations from the box below.

$$y = x^2 - 3 \qquad y = -x^2 + 3 \qquad y = 3^x$$
$$y = -x^3 + 3 \qquad y = 3^{-x} \qquad y = x^3 + 3$$

(i)

Answer .... [1]

(ii)

Answer .... [1]

(iii)

Answer .... [1]