IGCSE – graphs/tangents/gradients – 4

Oct 05 Paper 4

5 **Answer the whole of this question on one sheet of graph paper.**

$$f(x) = 1 - \frac{1}{x^2}, \ x \neq 0.$$

(a)

x	−3	−2	−1	−0.5	−0.4	−0.3	0.3	0.4	0.5	1	2	3
f(x)	p	0.75	0	−3	−5.25	q	q	−5.25	−3	0	0.75	p

Find the values of p and q. [2]

(b) (i) Draw an x-axis for $-3 \leqslant x \leqslant 3$ using 2 cm to represent 1 unit and a y-axis for $-11 \leqslant y \leqslant 2$ using 1 cm to represent 1 unit. [1]

(ii) Draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.3$ and for $0.3 \leqslant x \leqslant 3$. [5]

(c) Write down an integer k such that $f(x) = k$ has no solutions. [1]

(d) **On the same grid**, draw the graph of $y = 2x - 5$ for $-3 \leqslant x \leqslant 3$. [2]

(e) (i) Use your graphs to find solutions of the equation $1 - \frac{1}{x^2} = 2x - 5$. [3]

(ii) Rearrange $1 - \frac{1}{x^2} = 2x - 5$ into the form $ax^3 + bx^2 + c = 0$, where a, b and c are integers. [2]

(f) (i) Draw a tangent to the graph of $y = f(x)$ which is parallel to the line $y = 2x - 5$. [1]

(ii) Write down the equation of this tangent. [2]

Oct 06 Paper 4

4 **Answer the whole of this question on a sheet of graph paper.**

$$f(x) = 3x - \frac{1}{x^2} + 3, \ x \neq 0.$$

(a) The table shows some values of f(x).

x	−3	−2.5	−2	−1.5	−1	−0.5	−0.4	−0.3	0.3	0.4	0.5	1	1.5	2	2.5	3
f(x)	p	−4.7	−3.3	−1.9	−1	−2.5	−4.5	−9.0	−7.2	−2.1	0.5	q	7.1	8.8	10.3	r

Find the values of p, q and r. [3]

(b) Draw axes using a scale of 1 cm to represent 0.5 units for $-3 \leqslant x \leqslant 3$ and 1 cm to represent 2 units for $-10 \leqslant y \leqslant 12$. [1]

(c) On your grid, draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 3$. [5]

(d) Use your graph to solve the equations

(i) $3x - \frac{1}{x^2} + 3 = 0$, [1]

(ii) $3x - \frac{1}{x^2} + 7 = 0$. [3]

(e) $g(x) = 3x + 3$.
On the same grid, draw the graph of $y = g(x)$ for $-3 \leqslant x \leqslant 3$. [2]

(f) (i) Describe briefly what happens to the graphs of $y = f(x)$ and $y = g(x)$ for large positive or negative values of x. [1]

(ii) Estimate the gradient of $y = f(x)$ when $x = 100$. [1]