

IGCSE – Graphs/tangents/gradients -1

May 02 Paper 4

- 5 Answer the whole of this question on a sheet of graph paper.

Dimitra stands by a river and watches a fish.

The distance (d metres) of the fish from Dimitra after t minutes is given by

$$d = (t + 1)^2 + \frac{48}{(t + 1)} - 20.$$

Some values for d and t are given in the table below.

t	0	0.5	1	1.5	2	2.5	3	3.5	4	5	6	7
d	p	14.3	8	5.5	5	6	8	10.9	14.6	q	35.9	r

- (a) Find the values of p , q and r . [3]
- (b) Using a scale of 2 cm to represent 1 minute on the horizontal t -axis and 2 cm to represent 10 metres on the vertical d -axis, draw the graph of $d = (t + 1)^2 + \frac{48}{(t + 1)} - 20$ for $0 \leq t \leq 7$. [6]
- (c) Mark and label F the point on your graph when the fish is 12 metres from Dimitra and swimming away from her. Write down the value of t at this point, correct to one decimal place. [2]
- (d) For how many minutes is the fish less than 10 metres from Dimitra? [2]
- (e) By drawing a suitable line on your grid, calculate the speed of the fish when $t = 2.5$. [4]

Oct 02 Paper 4

- 5 Answer the whole of this question on a sheet of graph paper.

- (a) The table gives values of $f(x) = \frac{24}{x^2} + x^2$ for $0.8 \leq x \leq 6$.

x	0.8	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
$f(x)$	38.1	25	12.9	10	10.1	11.7	l	m	n	26	31	36.7

- Calculate, correct to 1 decimal place, the values of l , m and n . [3]
- (b) Using a scale of 2 cm to represent 1 unit on the x -axis and 2 cm to represent 5 units on the y -axis, draw an x -axis for $0 \leq x \leq 6$ and a y -axis for $0 \leq y \leq 40$. [6]
 - Draw the graph of $y = f(x)$ for $0.8 \leq x \leq 6$.
 - (c) Draw the tangent to your graph at $x = 1.5$ and use it to calculate an estimate of the gradient of the curve at this point. [4]
 - (d) (i) Draw a straight line joining the points (0, 20) and (6, 32). [1]
 - (ii) Write down the equation of this line in the form $y = mx + c$. [2]
 - (iii) Use your graph to write down the x -values of the points of intersection of this line and the curve $y = f(x)$. [2]
 - (iv) Draw the tangent to the curve which has the same gradient as your line in part d(i). [1]
 - (v) Write down the equation for the tangent in part d(iv). [2]

IGCSE – Graphs/tangents/gradients -2

Oct 03 Paper 4

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

t	0	1	2	3	4	5	6	7
$f(t)$	0	25	37.5	43.8	46.9	48.4	49.2	49.6

- (a) Using a scale of 2 cm to represent 1 unit on the horizontal t -axis and 2 cm to represent 10 units on the y -axis, draw axes for $0 \leq t \leq 7$ and $0 \leq y \leq 60$.
Draw the graph of the curve $y = f(t)$ using the table of values above. [5]
- (b) $f(t) = 50(1 - 2^{-t})$.
- (i) Calculate the value of $f(8)$ and the value of $f(9)$. [2]
- (ii) Estimate the value of $f(t)$ when t is large. [1]
- (c) (i) Draw the tangent to $y = f(t)$ at $t = 2$ and use it to calculate an estimate of the gradient of the curve at this point. [3]
- (ii) The function $f(t)$ represents the speed of a particle at time t .
Write down what quantity the gradient gives. [1]
- (d) (i) On the same grid, draw $y = g(t)$ where $g(t) = 6t + 10$, for $0 \leq t \leq 7$. [2]
- (ii) Write down the range of values for t where $f(t) > g(t)$. [2]
- (iii) The function $g(t)$ represents the speed of a second particle at time t .
State whether the first or second particle travels the greater distance for $0 \leq t \leq 7$.
You must give a reason for your answer. [2]

May 04 Paper 4

2 Answer all of this question on a sheet of graph paper.

(a) $f(x) = x^2 - x - 3$.

x	-3	-2	-1	0	1	2	3	4
$f(x)$	p	3	-1	-3	q	-1	3	r

- (i) Find the values of p , q and r . [3]
- (ii) Draw the graph of $y = f(x)$ for $-3 \leq x \leq 4$.
Use a scale of 1 cm to represent 1 unit on each axis. [4]
- (iii) By drawing a suitable line, estimate the gradient of the graph at the point where $x = -1$. [3]

(b) $g(x) = 6 - \frac{x^3}{3}$.

x	-2	-1	0	1	2	3
$g(x)$	8.67	u	v	5.67	3.33	-3

- (i) Find the values of u and v . [2]
- (ii) On the same grid as part (a) (ii) draw the graph of $y = g(x)$ for $-2 \leq x \leq 3$. [4]
- (c) (i) Show that the equation $f(x) = g(x)$ simplifies to $x^3 + 3x^2 - 3x - 27 = 0$. [1]
- (ii) Use your graph to write down a solution of the equation $x^3 + 3x^2 - 3x - 27 = 0$. [1]