(a) The curve $y = ax^n$, where a and n are constants, passes through the points (2.25, 27), (4, 64) and (6.25, p). Calculate the value of a, of n and of p. [5]

(b) The mass, m grams, of a radioactive substance is given by the formula $m = m_0 e^{-kt}$, where t is the time in days after the mass was first recorded and m_0 and k are constants.

The table below gives experimental values of t and m.

t (days)	10	20	30	40	50
m (grams)	40.2	27.0	18.0	12.2	8.1

Plot ln m against t and use your graph to estimate the value of m_0 and of k. [6]

10

x	2	3	4	5	6
y	9.2	8.8	9.4	10.4	11.6

The table above shows experimental values of the variables x and y. On graph paper draw the graph of xy against x^2. [3]

Hence

(i) express y in terms of x, [4]

(ii) find the value of x for which $x = \dfrac{45}{y}$. [2]

The table shows experimental values of the variables x and y which are related by the equation $y = Ab^x$, where A and b are constants.

x	2	4	6	8	10
y	9.8	19.4	37.4	74.0	144.4

(i) Use the data above in order to draw, on graph paper, the straight line graph of lg y against x, using 1 cm for 1 unit of x and 10 cm for 1 unit of lg y. [2]

(ii) Use your graph to estimate the value of A and of b. [5]

(iii) On the same diagram, draw the straight line representing $y = 2^x$ and hence find the value of x for which $Ab^x = 2^x$. [3]

8

x	10	100	1000	10 000
y	1900	250	31	4

The table above shows experimental values of the variables x and y which are related by an equation of the form $y = kx^n$, where k and n are constants.

(i) Using graph paper, draw the graph of lg y against lg x. [3]

(ii) Use your graph to estimate the value of k and of n. [4]

The table below shows values of the variables x and y which are related by the equation $y = \frac{a}{x + b}$, where a and b are constants.

x	0.1	0.4	1.0	2.0	3.0
y	8.0	6.0	4.0	2.6	1.9

(i) Using graph paper, plot y against xy and draw a straight line graph. [3]

(ii) Use your graph to estimate the value of a and of b. [4]

An alternative method for obtaining a straight line graph for the equation $y = \frac{a}{x + b}$ is to plot x on the vertical axis and $\frac{1}{y}$ on the horizontal axis.

(iii) Without drawing a second graph, use your values of a and b to estimate the gradient and the intercept on the vertical axis of the graph of x plotted against $\frac{1}{y}$. [3]

9

x	0.100	0.125	0.160	0.200	0.400
y	0.050	0.064	0.085	0.111	0.286

The table above shows experimental values of the variables x and y.

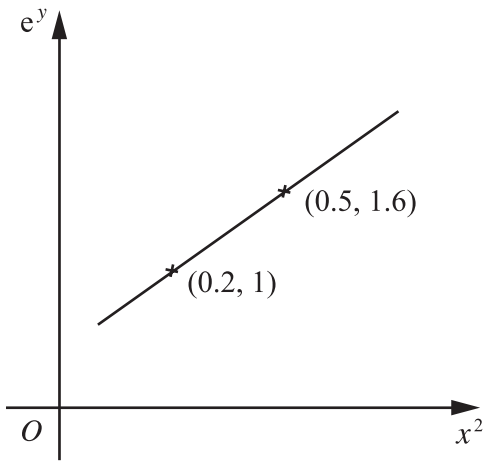
(i) On graph paper draw the graph of $\frac{1}{y}$ against $\frac{1}{x}$. [3]

Hence,

(ii) express y in terms of x, [4]

(iii) find the value of x for which $y = 0.15$. [2]

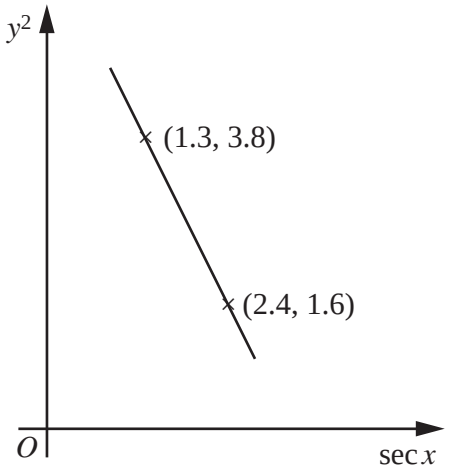
4 Variables x and y are such that, when e^y is plotted against x^2, a straight line graph passing through the points (0.2, 1) and (0.5, 1.6) is obtained.



(i) Find the value of e^y when $x = 0$. [2]

(ii) Express y in terms of x. [3]

4



Variables x and y are such that, when y^2 is plotted against $\sec x$, a straight line graph passing through the points (2.4, 1.6) and (1.3, 3.8) is obtained.

(i) Express y^2 in terms of $\sec x$. [3]

(ii) Hence find the exact value of $\cos x$ when $y = 2$. [2]

7 The table shows values of the variables p and v which are related by the equation $p = kv^n$, where k and n are constants.

v	10	50	110	230
p	1412	151	53	19

(i) Using graph paper, plot $\lg p$ against $\lg v$ and draw a straight line graph. [3]

Use your graph to estimate

(ii) the value of n, [2]

(iii) the value of p when $v = 170$. [2]

11 The table shows experimental values of variables s and t.

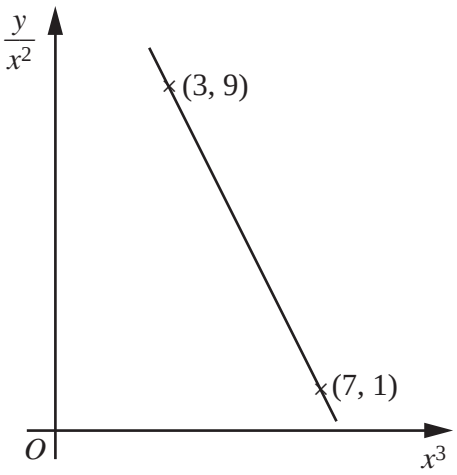
t	5	15	30	70	100
s	1305	349	152	55	36

(i) By plotting a suitable straight line graph, show that s and t are related by the equation $s = kt^n$, where k and n are constants. [4]

(ii) Use your graph to find the value of k and of n. [4]

(iii) Estimate the value of s when $t = 50$. [2]

1



The variables x and y are related so that, when $\frac{y}{x^2}$ is plotted against x^3, a straight line graph passing through (3, 9) and (7, 1) is obtained. Express y in terms of x. [4]

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$.