

(C) Higher Maths Homework (7)

① The functions f and g are defined on a suitable domain by $f(x) = x^2 - 1$ and $g(x) = x^2 + 2$.

(a) Find an expression for $f(g(x))$.

2

(b) Factorise $f(g(x))$.

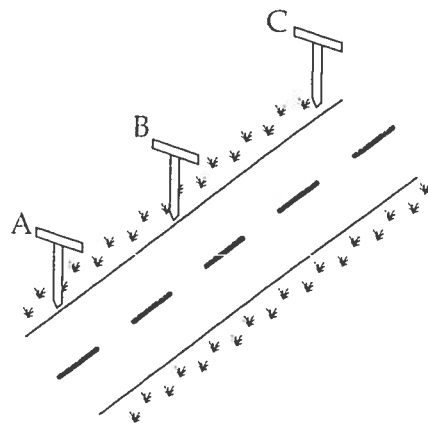
2

② For what value of t are the vectors $u = \begin{pmatrix} t \\ -2 \\ 3 \end{pmatrix}$ and $v = \begin{pmatrix} 2 \\ 10 \\ t \end{pmatrix}$ perpendicular?

2

③ (a) Roadmakers look along the tops of a set of T-rods to ensure that straight sections of road are being created. Relative to suitable axes the top left corners of the T-rods are the points $A(-8, -10, -2)$, $B(-2, -1, 1)$ and $C(6, 11, 5)$.

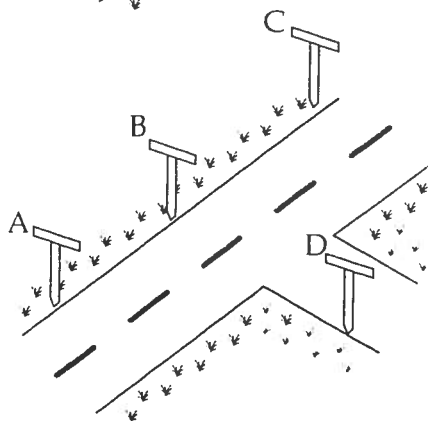
Determine whether or not the section of road ABC has been built in a straight line.



3

(b) A further T-rod is placed such that D has coordinates $(1, -4, 4)$.

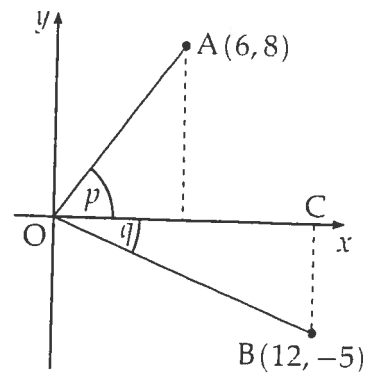
Show that DB is perpendicular to AB.



3

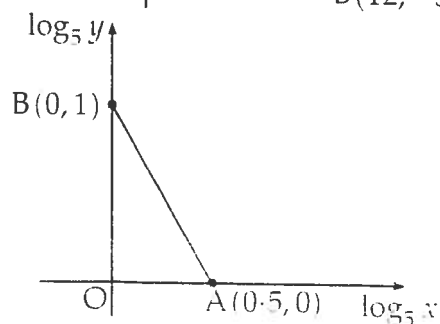
④ On the coordinate diagram shown, A is the point $(6, 8)$ and B is the point $(12, -5)$. Angle $AOC = p$ and angle $COB = q$.

Find the exact value of $\sin(p + q)$.



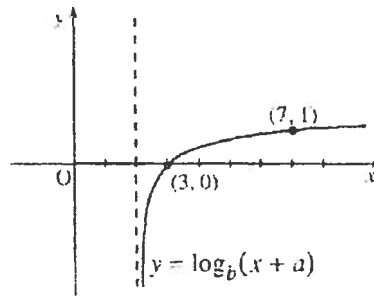
4

⑤ The graph illustrates the law $y = kx^n$. If the straight line passes through $A(0.5, 0)$ and $B(0, 1)$, find the values of k and n .



4

- 6 The diagram shows part of the graph of $y = \log_b(x+a)$.
Determine the values of a and b .



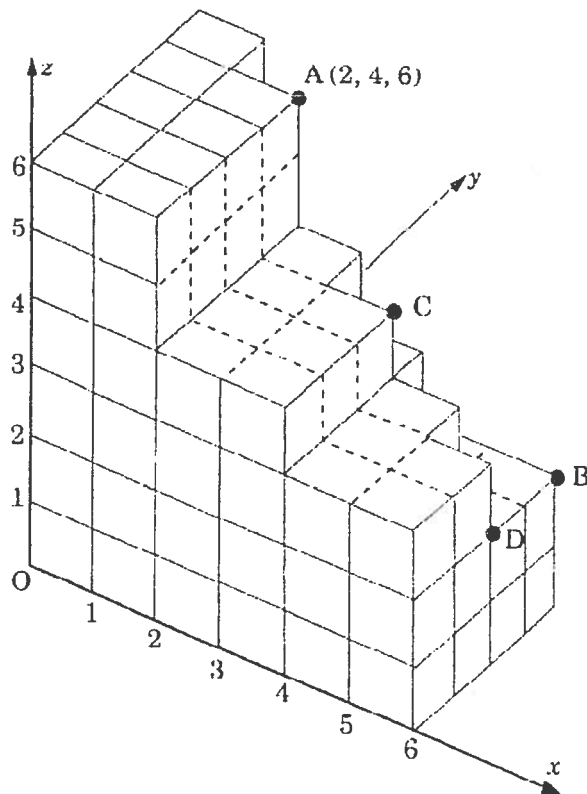
3

- 7 If x° is an acute angle such that $\tan x^\circ = \frac{4}{3}$, show that the exact value of $\sin(x^\circ + 30^\circ)$ is $\frac{4\sqrt{3} + 3}{10}$.

3

- 8 With coordinate axes as shown, the point A is $(2, 4, 6)$.

- (a) Write down the coordinates of B, C and D .
- (b) Show that C is the midpoint of AD .
- (c) By using the components of the vectors \vec{OA} and \vec{OB} , calculate the size of angle AOB , where O is the origin.
- (d) Hence calculate the size of angle OAB .



(3)

(1)

(4)

(2)