HIGHER MATHS
CHRISTMAS REVISION SHEET

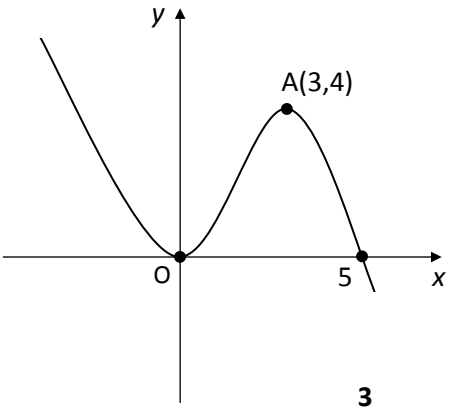
Non Calculator Questions

1. The diagram shows part of the graph of $y = f(x)$.

Sketch the graph of $y = -f(x+3)$

marking clearly the **new** positions of the

highlighted points and stating their new coordinates.



3

2. A curve has as its equation $y = \dfrac{x^2 - 4x}{\sqrt{x}}$, where $x \in R$ and $x > 0$.

Find the gradient of the tangent to this curve at the point where $x = 4$.

6

3. A circle has as its equation $x^2 + y^2 - 4x + 3y + 5 = 0$.

Find the equation of the tangent at the point $(3,-2)$ on the circle.

5

4. Given that $x - 1$ is a factor of $x^3 + kx^2 - 5x + 6$, find the value of k and hence fully factorise the expression.

4

5. For what value of p, where $p > 0$,

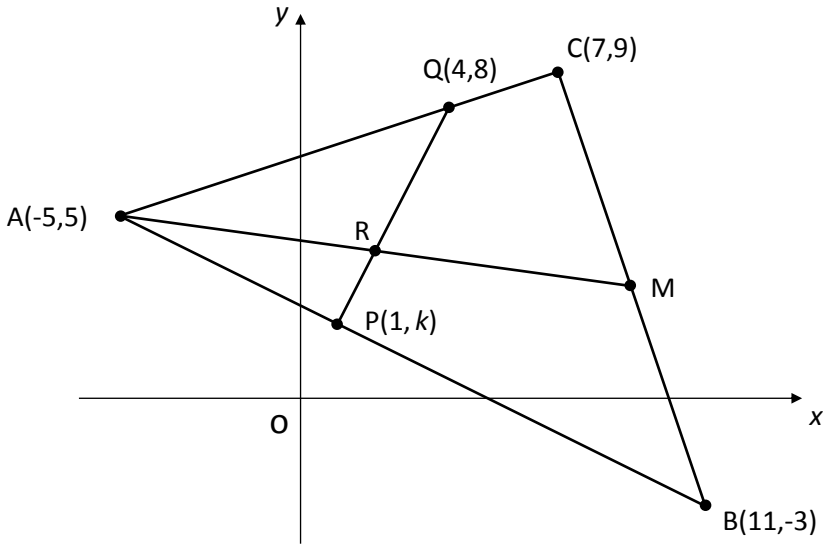
does the equation $(p^2 + 11)x^2 - 12px + p^2 = 0$ have equal roots?

6

Calculator Questions

6. Triangle ABC has vertices A(-5,5), B(11,-3) and C(7,9).

Q(4,8) lies on AC and AM is a median of the triangle.



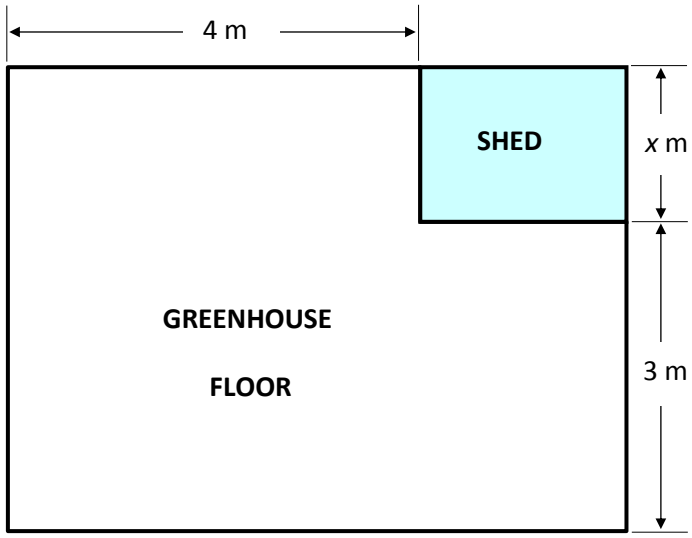
(a) Given that A, P and B are collinear, find the value of k. **4**

(b) Hence find the equation of PQ. **2**

(c) Find the coordinates of R, the point of intersection between the line PQ and the median AM. **5**

7. The floor plan of a rectangular greenhouse is shown below. All dimensions are in metres.

The gardener places a rectangular wooden storage shed, of width x metres, in one corner.



(a) Given that the **area of the shed** is 3 square metres, show clearly that the area of greenhouse floor remaining, A square metres, is given in terms of x as

$$A(x) = 12 + 4x + \frac{9}{x}.$$

3

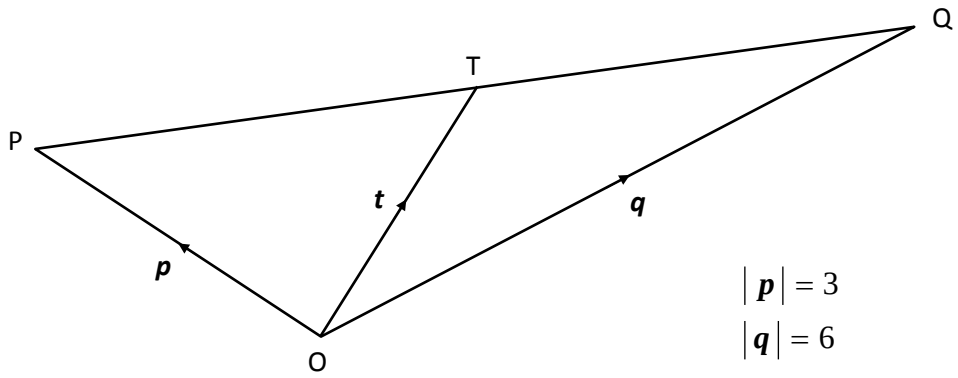
(b) Hence find the value of x which **minimises** the area of the greenhouse floor remaining, **justifying your answer**.

5

8. The vector diagram below shows triangle POQ where T is the mid-point of PQ.

Displacements $\overrightarrow{OP}$, $\overrightarrow{OQ}$ and $\overrightarrow{OT}$ are represented by vectors ***p***, ***q*** and ***t*** respectively.

Vectors ***p*** and ***q*** have magnitudes of 3 units and 6 units and $\angle POQ = 120^\circ$.



$|\boldsymbol{p}| = 3$

$|\boldsymbol{q}| = 6$

$\angle POQ = 120^\circ$

(a) Show clearly that vector ***t*** can be expressed in terms of vectors ***p*** and ***q*** as

$$\boldsymbol{t} = \tfrac{1}{2}(\boldsymbol{p} + \boldsymbol{q})$$ **3**

(b) Hence, by considering the scalar product $\boldsymbol{p}.\boldsymbol{t}$, show that angle TOP is a right-angle.

5

END OF QUESTIONS

PS HAPPY NEW YEAR!