1 A trapezium of height $\left(32-18\sqrt{2}\right)$ cm has an area of $\left(12+5\sqrt{2}\right)$ cm^2.

Without using a calculator, find the sum of the length of the two parallel sides in the form $a+b\sqrt{2}$ where a and b are integers. [3]

2 The line $3y - x + 1 = 0$ intersects the curve $x + 1 = \frac{1}{y}$ at the points A and B.

Find the y-coordinates of A and of B. [3]

3 **(i)** By completing the square, express $-\frac{1}{4}x^2-2x+5$ in the form $a(x+h)^2+k$. [2]

(ii) Hence, state the stationary value of $-\frac{1}{4}x^2-2x+5$ and its corresponding value of x. [2]

4 Integrate $\frac{9}{(3x-2)^4}+\frac{4x}{4x^2-5x}$ with respect to x. [4]

5 Express $\dfrac{15x^3+19x^2+116x-6}{(5x-1)(x^2+9)}$ in partial fractions. [6]

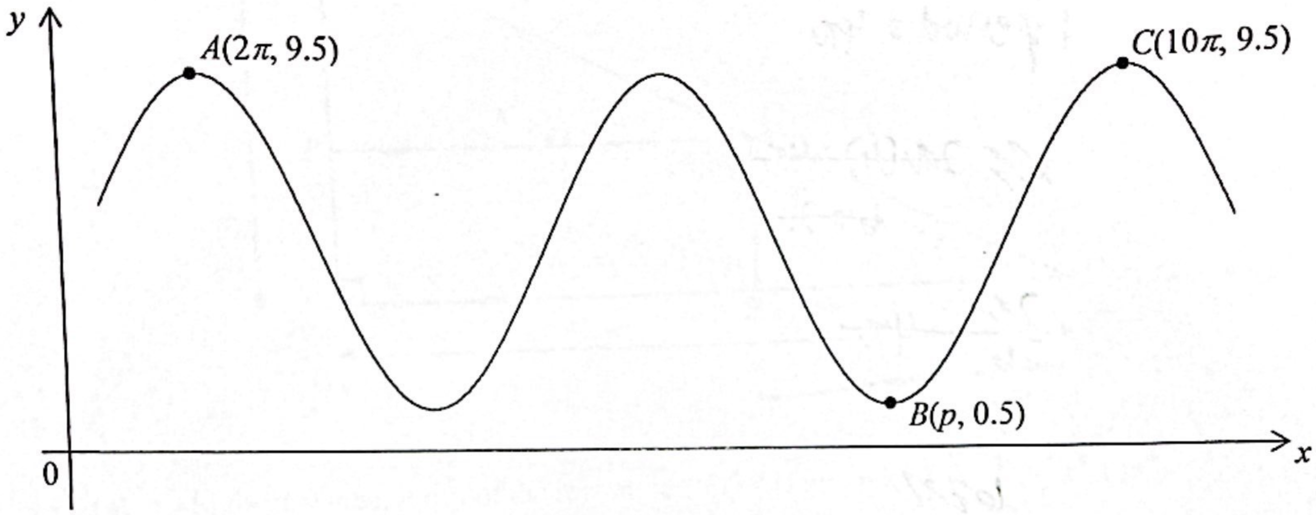
6 A polynomial is given as $P(x) = 2x^3 + 3x^2 + mx + 30$ where m is a constant.

(a) Find the value of m if $P(x)$ leaves a remainder of 36 when divided by $x + 2$. [2]

(b) For $m = -29$, factorise $P(x)$ completely if $x^2 + 3x + q$ is a factor of $P(x)$. [4]

7 The diagram shows part of a cosine curve, $y = a\cos\frac{x}{b} + c$, where a, b and c are constants.

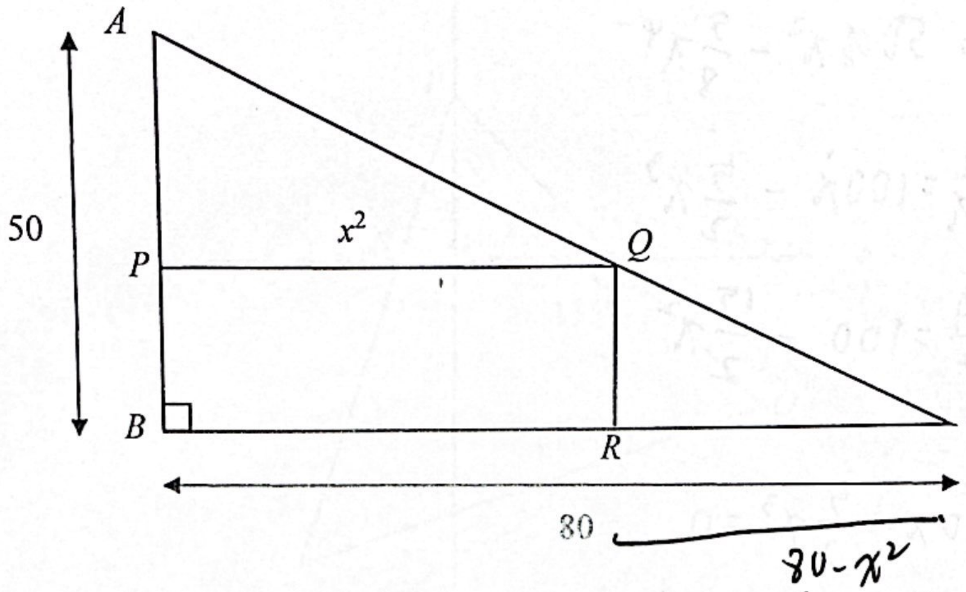
The curve has maximum points at $A(2\pi, 9.5)$ and $C(10\pi, 9.5)$, and a minimum point at $B(p, 0.5)$.



(a) Show that $p = 8\pi$. [2]

(b) Hence, showing your working clearly, find the equation of the curve. [4]

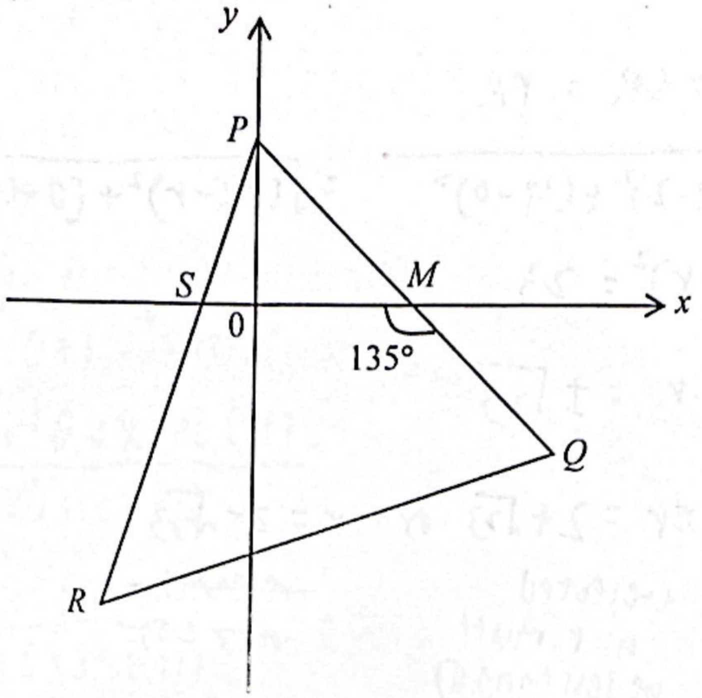
8 A farm is in the shape of a right-angled triangle ABC such that $AB = 50$ m and $BC = 80$ m. A rectangular pig sty $BPQR$, where $PQ = x^2$ m, is to be built inside triangle ABC.



(a) Show that area, A m^2, of the rectangle $BPQR$ is given by $\left(50x^2 - \frac{5}{8}x^4\right)$ m^2. [2]

(b) Given that x varies, find the stationary value of A and determine its nature. [5]

9 The diagram shows an isosceles triangle PQR where $PR = QR$ and angle $QMS = 135°$.



(i) Show that gradient of $PQ = -1$. [1]

Given further that point $M(2, 0)$ is the midpoint of PQ.

(ii) Find the coordinates of P and of Q. [4]

(iii) Given that coordinates of R is $(-3, r)$, find the value of r. [2]

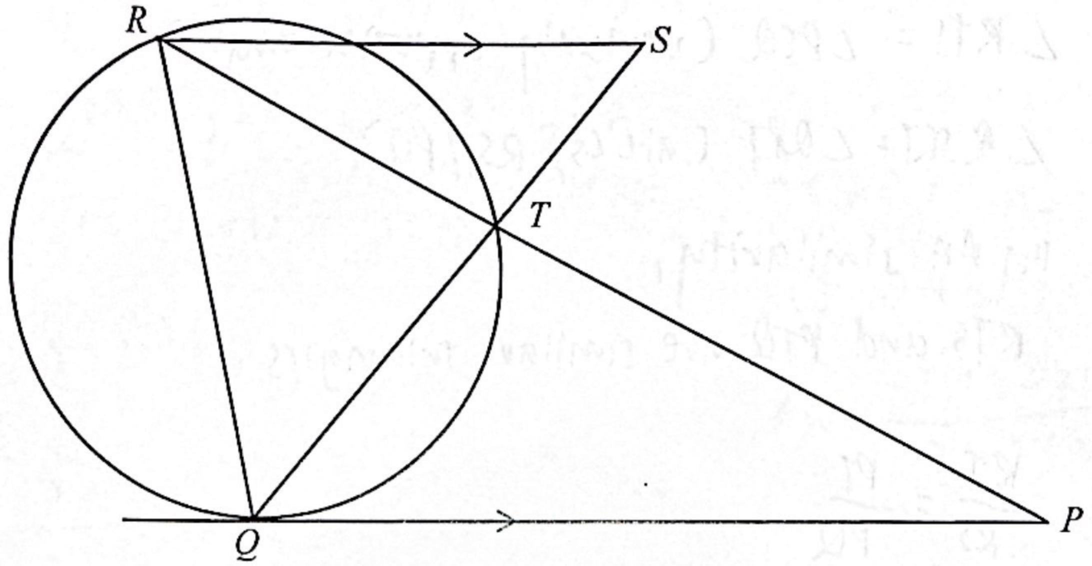
(iv) Find the area of the triangle PQR. [2]

10 **(a)** Prove that $\dfrac{\tan\theta}{\sec\theta+1}+\cot\theta=\operatorname{cosec}\theta$. [4]

Th

(b) Hence, solve $\dfrac{\tan 2\theta}{\sec 2\theta + 1} + \cot 2\theta = -4$ for $0° \le \theta \le 180°$. [4]

11 In the diagram, PQ is a tangent to the circle at the point Q.
QTS is a straight line and PQ is parallel to SR.
The point P, T and R lie on a straight line and $TR : PR = 1 : 3$.



(a) Show that angle QRT = angle QSR. [2]

[5]

(b) Prove that $PQ \times PR = 3\ PT \times RS$.

12 **(a)** Solve the equation $4^{3x} \times 9^{x} = 2^{4x+3} \times 3^{x-2}$. [4]

(b) Solve the equation $\log_3(6-3x) - \log_{\sqrt{3}}(2-x) = 0$. [4]

13 **(a)** A viscous liquid is poured onto a flat surface. It forms a circular patch which grows at a steady rate of 10 cm^2/s.

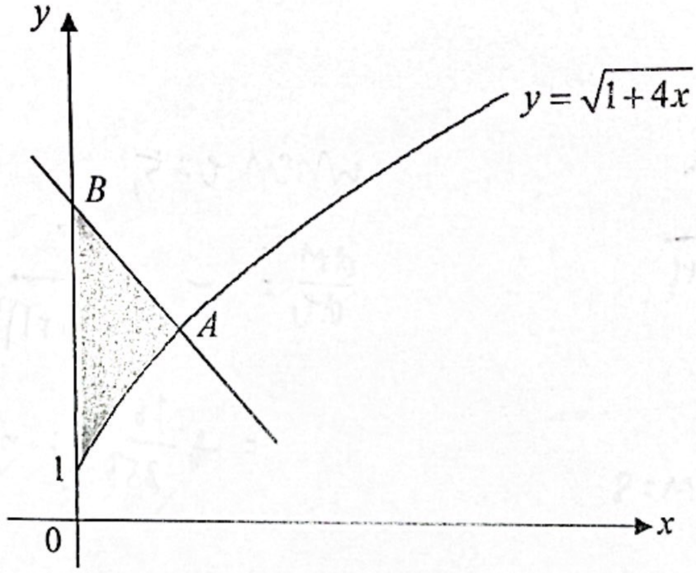
(i) Find the radius of the patch 27 seconds after the pouring has started. [2]

(ii) Find the rate of change of the radius at this instant. [3]

(b) In a chemical reaction, the mass, M grams of a product at t minutes is given by $M(3t+1)=k$ where k is a constant. Given that $M = 8$ when $t = 2$, find the rate of decrease of M when $t = 5$. [4]

14 The diagram shows part of the curve $y=\sqrt{1+4x}$ with the normal to the curve at A.

Given that the gradient of the normal at A is $-\frac{3}{2}$ and it meets the y-axis at B.



(a) Find the coordinates of B. [5]

(b) Find the shaded area formed by the curve, line AB and the y-axis. [5]