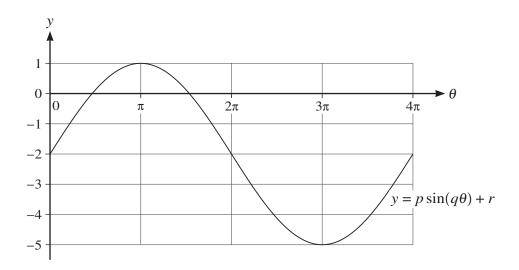
| | and the possible values of the constant p . | [4 |
|---|---|-----|
| • | | ••• |
| | | |
| | | |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| | | |
| | | |
| | | |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| | | |
| | | |
| • | | |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| • | | ••• |
| | | |
| | FET 455 | J |



The diagram shows part of the curve with equation $y = p \sin(q\theta) + r$, where p, q and r are constants.

| (a) | State the value of p . | [1] |
|-----|--------------------------|-----|
| | | |
| | | |
| | | |
| (b) | State the value of q . | [1] |
| | | |
| | | |
| | | |
| | | |
| | | |
| (c) | State the value of r . | [1] |
| | | |
| | | |
| | | |

3 An arithmetic progression has first term 4 and common difference *d*. The sum of the first *n* terms of the progression is 5863.

| (a) | Show that $(n-1)d = \frac{11726}{n}$ | - 8. | [1] |
|-----|--------------------------------------|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| (b) | Given that the n th term is 139 | 0, find the values of n and d , g | iving the value of d as a fraction. [4] |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | FI 35-4 |
| | | | |

4 (a) The curve with equation $y = x^2 + 2x - 5$ is translated by $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

| Find the equation of the translated curve, giving your answer in the form $y = ax^2 + bx + c$. | |
|---|------|
| | |
| | |
| | •••• |
| | •••• |
| | •••• |
| | •••• |
| | •••• |
| | •••• |
| | •••• |
| | •••• |

(b) The curve with equation $y = x^2 + 2x - 5$ is transformed to a curve with equation $y = 4x^2 + 4x - 5$.

Describe fully the single transformation that has been applied. [2]

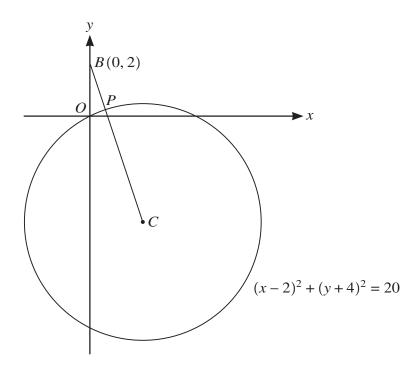
| (a) | Solve the equation $6\sqrt{y} + \frac{2}{\sqrt{y}} - 7 = 0$. | [4] |
|-----|---|----------|
| | •• | |
| | | |
| | | |
| | | |
| | | •••••• |
| | | |
| | | |
| | | |
| | | ••••• |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| (b) | Hence solve the equation $6\sqrt{\tan x} + \frac{2}{\sqrt{\tan x}} - 7 = 0$ for $0^{\circ} \le x \le 360^{\circ}$. | [3 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | III (25) |
| | | |
| | | 700 |

Page 6 of 17 9709_s22_qp_13 The function f is defined by $f(x) = 2x^2 - 16x + 23$ for x < 3. (a) Express f(x) in the form $2(x+a)^2 + b$. [2]

| Find the range of f. | [1] |
|----------------------|-----|
| | |
| | |
| | |
| | |
| | |
| | |

(b)

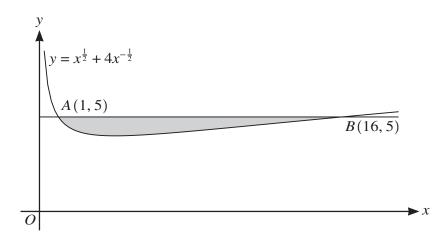
| (c) | Find an expression for $f^{-1}(x)$. | [3] |
|--------------|---|------|
| | | •••• |
| | | |
| | | •••• |
| | | |
| | | •••• |
| | | •••• |
| | | •••• |
| | | •••• |
| | | •••• |
| | | •••• |
| | | •••• |
| | e function g is defined by $g(x) = 2x + 4$ for $x < -1$. | |
| (d) | Find and simplify an expression for $fg(x)$. | [2] |
| | | •••• |
| | | •••• |
| | | •••• |
| | | •••• |
| | | |
| | | •••• |
| | | |
| | | |
| | | |
| | | ġ [|



The diagram shows the circle with equation $(x-2)^2 + (y+4)^2 = 20$ and with centre C. The point B has coordinates (0, 2) and the line segment BC intersects the circle at P.

| (a) | Find the equation of BC . | [2] |
|-----|-----------------------------|-----|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

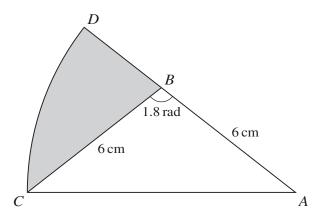
| Hence find the coordinates of P , giving your answer in exact form. | |
|---|--------|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | •••••• |
| | •••••• |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |



The diagram shows the curve with equation $y = x^{\frac{1}{2}} + 4x^{-\frac{1}{2}}$. The line y = 5 intersects the curve at the points A(1, 5) and B(16, 5).

| (a) | Find the equation of the tangent to the curve at the point A . | [4] |
|-----|--|-----|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Calculate the area of the shaded region. | |
|--|--|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |



The diagram shows triangle ABC with AB = BC = 6 cm and angle ABC = 1.8 radians. The arc CD is part of a circle with centre A and ABD is a straight line.

| (a) | Find the perimeter of the shaded region. | [5] |
|-----|--|-------|
| | | ••••• |
| | | •••• |
| | | •••• |
| | | ••••• |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | •••• |
| | | •••• |
| | | •••• |
| | | |
| | | |

| Find the area of the shaded region. | [3 |
|-------------------------------------|----------|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | F=7.04 v |
| | |
| | /oo\ |

10 The function f is defined by $f(x) = (4x + 2)^{-2}$ for $x > -\frac{1}{2}$.

| | Find $\int_{1}^{\infty} f(x) dx$. | |
|----|------------------------------------|--------|
| | | |
| | | |
| | | |
| •• | | |
| | | |
| | | |
| | | |
| •• | | |
| | | |
| | | |
| | | |
| •• | | |
| | | |
| | | |
| | | |
| •• | | ••••• |
| •• | | |
| | | |
| | | |
| •• | | •••••• |
| •• | | |
| | | |
| | | |
| | | |
| •• | | |
| | | |
| | | |
| | | |
| •• | | |
| | | |

A point is moving along the curve y = f(x) in such a way that, as it passes through the point A, its y-coordinate is **decreasing** at the rate of k units per second and its x-coordinate is **increasing** at the rate of k units per second.

| (b) | Find the coordinates of A . | [6] |
|------------|-------------------------------|-----|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| the (| equation $y = -\frac{m}{x}$. There is a single point P on the curve such that the straight line is a tangent to curve at P. | | | |
|-------|--|----|--|--|
| (a) | Find the coordinates of P , giving the y -coordinate in terms of m . | [6 | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

The normal to the curve at P intersects the curve again at the point Q.

| |
|--------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| 60 |