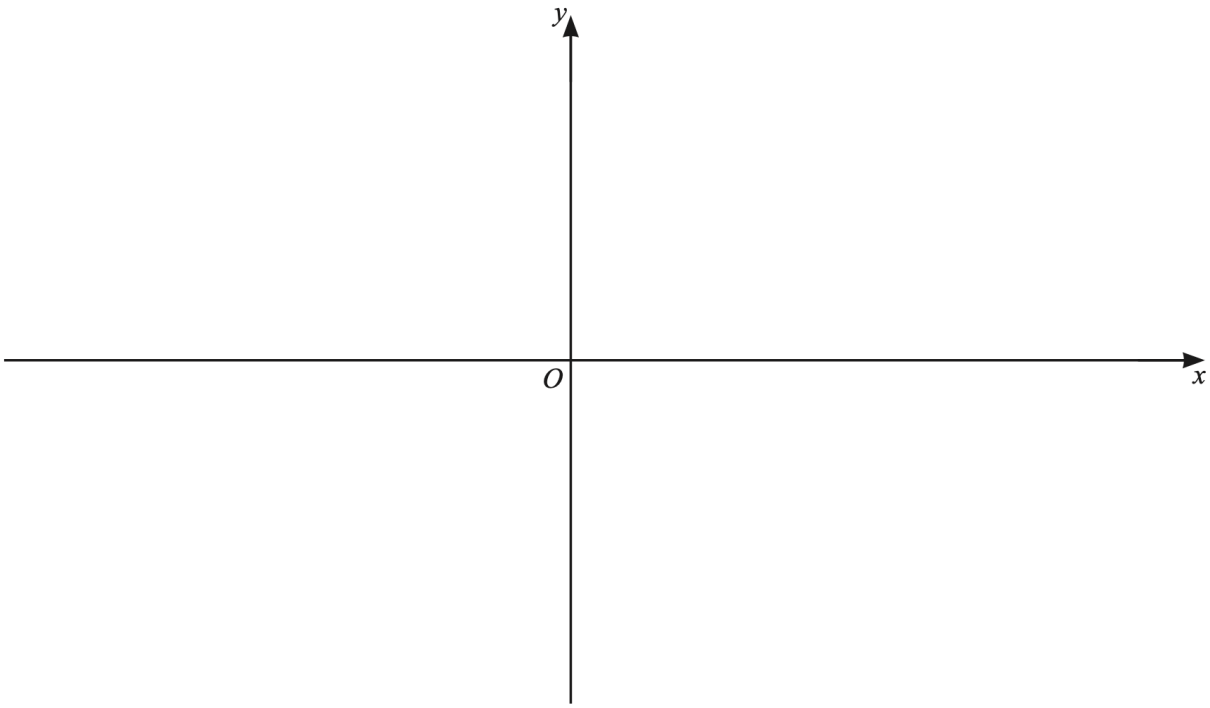
Chapter 1 to 9, 11a Test

/80 marks

1. (a) On the axes, draw the graph of $y = |3x^2 + 13x - 10|$, stating the coordinates of the points where the graph meets the axes.

[4]



(b) Find the set of values of the constant *k* such that the equation $kx^2 - 3(k + 1)x + 25 = 0$ has equal roots.

[4]

2. (a) Solve the following simultaneous equations.

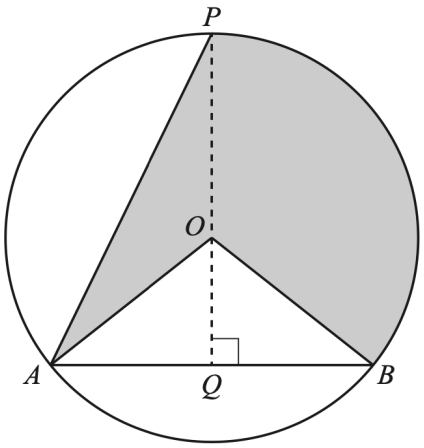
$$3y - 2x + 2 = 0$$
$$xy = \frac{1}{2}$$

[3]

(b) Solve the equation $lg\,(2x - 1) + lg\,(x + 2) = 2 - lg\,4$.

[5]

3.



The diagram shows a circle, centre *O*, radius 10 cm. The points *A*, *B* and *P* lie on the circumference of the circle. The chord *AB* is of length 14 cm. The point *Q* lies on *AB* and the line *POQ* is perpendicular to *AB*.

a. Show that angle *POA* is 2.366 radians, correct to 3 decimal places.

[2]

b. Find the area of the shaded region.

[3]

c. Find the perimeter of the shaded region.

[5]

4. When e^{2y} is plotted against x^2, a straight line graph passing through the points (4, 7.96) and (2, 3.76) is obtained.

a. Find *y* in terms of *x*.

[5]

b. Find *y* when *x* = 1.

[2]

c. Using your equation from **part (a)**, find the positive values of *x* for which the straight line exists.

[3]

5. The first four terms in ascending powers of *x* in the expansion $(3 + ax)^4$ can be written as $81 + bx + cx^2 + \frac{3}{2}x^3$. Find the values of the constants *a*, *b* and *c*.

[6]

6.The points P and Q have coordinates (5, -12) and (15, -6) respectively. The point R lies on the line l, the perpendicular bisector of the line PQ. The x-coordinate of R is 7.

a. Find the y-coordinate of R.

[4]

b. The point S lies on l such that its distance from PQ is 3 times the distance of R from PQ. Find the coordinates of the two possible positions of S.

[3]

7. The function f is defined by $f(x) = 2 - \sqrt{x + 5}$ for $-5 \leq x < 0$.

(i) Write down the range of f.

[2]

(ii) Find $f^{-1}(x)$ and state its domain and range.

[4]

The function g is defined by $g(x) = \frac{4}{x}$ for $-5 \leq x < -1$.

(iii) Solve $fg(x) = 0$.

[3]

8. Find constants *a*, *b* and *c* such that $\frac{\sqrt{pq}^{\frac{1}{3}}r^{-3}}{(\sqrt[5]{pq}^{-1})^{2}r^{-1}} = p^{a}q^{b}r^{c}$.

[3]

9. The polynomial $p(x) = 6x^{3} + ax^{2} + bx + 2$, where *a* and *b* are integers, has a factor of $x - 2$.

(a) Given that p(1) = –2p(0) , find the values of *a* and *b*.

[5]

(b) Using your values of a and b,

(i) find the remainder when $p(x)$ is divided by $2x - 1$.

[2]

(ii) factorise $p(x)$.

[2]

10.(a) Show that $\frac{cos\, x}{1-sin\, x} + \frac{1-sin\, x}{cosx} = 2sec\, x$.

[5]

(b) Hence solve the equation $\frac{cos\frac{\theta}{2}}{1-sin\frac{\theta}{2}} + \frac{1-sin\frac{\theta}{2}}{cos\frac{\theta}{2}} = 8cos^2\frac{\theta}{2}$ for $-360° < \theta < 360°$.

[5]