FORMULAE LIST

Circle:
The equation \( x^2 + y^2 + 2gx + 2fy + c = 0 \) represents a circle centre \((-g, -f)\) and radius \(\sqrt{g^2 + f^2 - c}\).
The equation \((x-a)^2 + (y-b)^2 = r^2\) represents a circle centre \((a, b)\) and radius \(r\).

Scalar Product: \[ \mathbf{a} \cdot \mathbf{b} = |\mathbf{a}||\mathbf{b}| \cos \theta, \text{ where } \theta \text{ is the angle between } \mathbf{a} \text{ and } \mathbf{b} \]
or \[ \mathbf{a} \cdot \mathbf{b} = a_1 b_1 + a_2 b_2 + a_3 b_3 \text{ where } \mathbf{a} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix} \text{ and } \mathbf{b} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}. \]

Trigonometric formulae:
\[
\begin{align*}
\sin (A \pm B) &= \sin A \cos B \pm \cos A \sin B \\
\cos (A \pm B) &= \cos A \cos B \mp \sin A \sin B \\
\sin 2A &= 2 \sin A \cos A \\
\cos 2A &= \cos^2 A - \sin^2 A \\
&= 2 \cos^2 A - 1 \\
&= 1 - 2 \sin^2 A
\end{align*}
\]

Table of standard derivatives:
\[
\begin{array}{|c|c|}
\hline
f(x) & f'(x) \\
\hline
\sin ax & a \cos ax \\
\cos ax & -a \sin ax \\
\hline
\end{array}
\]

Table of standard integrals:
\[
\begin{array}{|c|c|}
\hline
f(x) & \int f(x)dx \\
\hline
\sin ax & -\frac{1}{a} \cos ax + c \\
\cos ax & \frac{1}{a} \sin ax + c \\
\hline
\end{array}
\]
The skills in this series of worksheets appear frequently.

These are the GIFTS you must take to succeed

Intersection of Straight Line and a Circle

Find the coordinates of the points of intersection on each:

1. $x^2 + y^2 - 6x + 2y - 35 = 0$ and $y = 2x + 8$
2. $x^2 + y^2 - 6x - 4y + 8 = 0$ and $y = 2x + 1$
3. $x^2 + y^2 - 6x - 8y - 55 = 0$ and $x = 31 - 2y$
4. $x^2 + y^2 - 4x - 10y - 24 = 0$ and $y = 12 - x$
5. $x^2 + y^2 = 8$ and $y = 4 - x$
6. $x^2 + y^2 - 6x - 2y - 24 = 0$ and $y = x$
7. $x^2 + y^2 + 4x + 2y - 20 = 0$ and $y = 2x + 8$
8. $x^2 + y^2 + 18x + 20y + 81 = 0$ and $y = x + 1$
9. $x^2 + y^2 - 6x - 8y - 4 = 0$ and $y = 14 - x$
10. $x^2 + y^2 - 2x - 4y + 1 = 0$ and $x + y = 1$

APPLYING QUESTION

(a) Find the equation of a circle which has D (4, 1) and F (-2, -7) as its diameter. Leave your answer in the form $x^2 + y^2 + 2gx + 2fy + c = 0$.

(b) Establish the coordinates of the points of intersection between the circle and the line $y = x + 1$