SAT PREP

Assignment : **Coordinate Geometry and Circle**

1. Find the value of k for which the line $y = 2kx + 7$ is a tangent to the curve $y = 3 + kx^2$.

2. A circle with centre C has equation $x^2 + y^2 - 6x + 4y + 8 = 0$.
   a) Express the equation in the form $(x - a)^2 + (y - b)^2 = r^2$.
   b) Find the coordinates of C and the radius of the circle.

3. Find the set of values of k for which the line $y = kx - 4$ intersects the curve $y = x^2$ at two distinct points.

4. The line $y = 5 - kx$, where k is an integer, is a tangent to the curve $y = 2k - x^2$.
   a) Find the possible values of k.

   When $k = 2$, the line $y = 5 - kx$ is a tangent to the curve $y = 2k - x^2$ at point A.
   b) Find the coordinates of A.

5. Determine the shortest distance from the point $A(1, 3)$ to the circle with equation $x^2 + y^2 - 10x - 12y + 45 = 0$.

6. A curve has equation $y = 2x^2 + kx - 1$ and a line has equation $x + y + k = 0$, where k is a constant.
   a) State the value of k for which the line is a tangent to the curve.
   b) For this value of k find the coordinates of the point where the line touches the curve.

7. The equation of a line is $y = x - k$, where k is a constant, and the equation of a curve is $x^2 + 2y = k$.
   a) When $k = 1$, the line intersects the curve at the points A and B. Find the coordinates of A and the coordinates of B.
   b) Find the value of k for which the line $y = x - k$ is a tangent to the curve $x^2 + 2y = k$.

8. A circle with centre C has equation $x^2 + y^2 - 8x - 6y - 20 = 0$.
   a) Find the coordinates of C and the radius of the circle.
   b) $A(10, 0)$ lies on the circle. Find the equation of the tangent to the circle at A.

9. Find the equation of the tangent to the circle $x^2 + y^2 - 12x + 26 = 0$ at the point $P(3, 1)$.

   Give your answer in the form $ax + by + c = 0$, where a, b and c are integers.

10. A line has equation $y = 2kx - 9$ and a curve has equation $y = x^2 - kx$, where k is a constant.
    a) Find the two values of k for which the line is a tangent to the curve.
    b) For each value of k, find the coordinates of the point where the line is a tangent to the curve, and find the equation of the line that joins these two points.

Answer

1. $k = -4$

2. **a)** $(x - 3)^2 + (y + 2)^2 = 5$

b) Centre $(3, -2)$, radius $\sqrt{5}$

3. $k < -4, k > 4$

4. **a)** $k = 2$ or $k = -10$ **b)** $(1, 3)$

5. 1

6. **a)** $k = 3$ **b)** $(-1, -2)$

7. **a)** $(-3, -4)$ and $(1, 0)$ **b)** $k = -\frac{1}{3}$

8. **a)** C$(4, 3)$, radius $3\sqrt{5}$ **b)** $y = 2x - 20$

9. $3x - y - 8 = 0$

10. **a)** $k = 2$ or $k = -2$

b) $(3, 3)$ and $(-3, 3)$; $y = 3$