1. (a) Write the equation of the circle with centre $(-7, 1)$ and radius $3\sqrt{7}$
   (b) State the centre and the radius of $x^2 + (y + 11)^2 = 44$
   (c) Find the centre and the radius for the circle $x^2 + y^2 - 12x + 8y - 12 = 0$
   (d) Find the equation of the circle which is concentric with $x^2 + y^2 = 7$ and has
       double the radius **(7)**

2. Show that the line $y - 2x + 3 = 0$ is a tangent to the circle $x^2 + y^2 - 16x + 4y + 23 = 0$
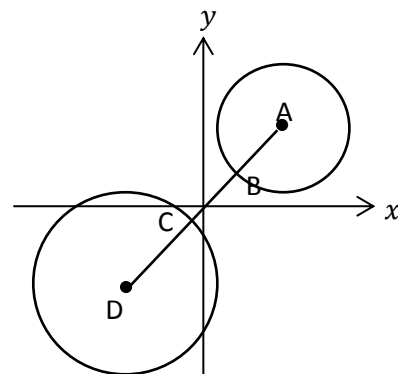   and find the point of contact. **(4)**

3. The equation of the circle with centre A is
   $x^2 + y^2 - 14x - 12y + 60 = 0$

   The equation of the circle with centre D is
   $x^2 + y^2 + 18x + 12y + 17 = 0$

   AD cuts the circumferences at B and C as shown.

   Find the length of BC. **(4)**

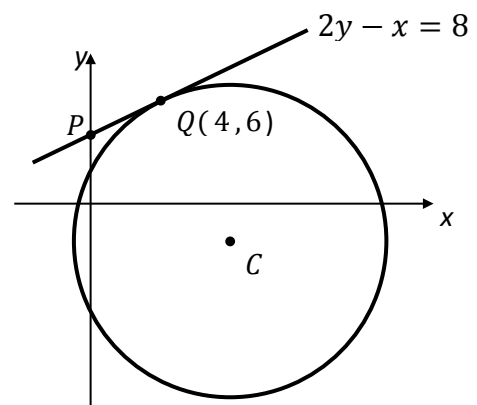4. Find the equation of the tangent to $x^2 + y^2 - 8x + 4y - 20 = 0$ at $P(-2, -4)$ **(4)**

5. The diagram below shows a circle, centre C, with equation $x^2 + y^2 - 16x + 4y - 12 = 0$
   The point $Q(4, 6)$ lies on the circumference of the circle.
   The line PQ is a tangent to the circle.

   The equation of the tangent shown is $2y - x = 8$

   (a) Write down the co-ordinates of point P **(2)**

   (b) Establish the equation of the circle which
       passes through the points P, Q and C **(5)**