Circles – Section Test
(Answers)

1)

$x^2 + y^2 = 16$

Comparing with the standard equation for a circle $x^2 + y^2 = r^2$

with centre O and radius r, gives $r^2 = 16 \Rightarrow r = 4$

The radius of the circle is 4.

2)

The equation $(x+3)^2 + (y-1)^2 = 4$

represents a circle with centre (-3, 1) and radius 2.

3)

The equation of a circle with centre (a, b) and radius r is

$$(x-a)^2 + (y-b)^2 = r^2$$

so the equation of a circle with centre (2, 1) and radius 6 is

$$(x-2)^2 + (y-1)^2 = 6^2$$

$$(x-2)^2 + (y-1)^2 = 36$$

4)

The equation of a circle with centre (3, -2) and radius 5 is

$$(x-3)^2 + (y+2)^2 = 25$$

5)

$(x-1)^2 + (y+3)^2 = 20$

The centre of the circle is (1, -3).

6)

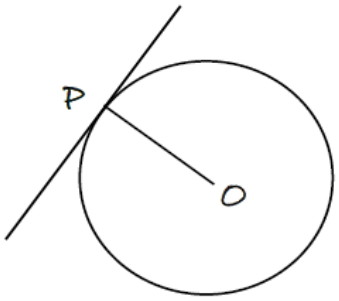
The radius is $\sqrt{20}$

7)

The centre of the circle is translated from (-2, -1) to (0, 0), so the circle has been translated through $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$

8)

The tangent at P is perpendicular to the radius OP.
The gradient of OP is 2
so the gradient of the tangent is -0.5.



9)

Substituting $y = x$ into $x^2 + y^2 = 8$

$$x^2 + x^2 = 8$$

$$2x^2 = 8$$

$$x^2 = 4$$

gives $x = \pm 2$

There are two distinct solutions, so the line cuts the circle at two points.

10)

Equation of circle is

$$(x-2)^2 + (y+3)^2 = r^2$$

Substituting in

$$y = 2x + 3$$

gives

$$(x-2)^2 + (2x+3+3)^2 = r^2$$

$$(x-2)^2 + (2x+6)^2 = r^2$$

$$x^2 - 4x + 4 + 4x^2 + 24x + 36 = r^2$$

$$5x^2 + 20x + 40 - r^2 = 0$$

Since the line is a tangent, it touches the circle, so the quadratic equation has a repeated root and therefore the discriminant must be zero.

For the quadratic equation,

$$a = 5, b = 20, c = 40 - r^2$$

Discriminant

$$= b^2 - 4ac = 0$$

$$20^2 - 4 \times 5(40 - r^2) = 0$$

$$400 = 20(40 - r^2)$$

$$20 = 40 - r^2$$

$$r^2 = 20$$

$$r = \sqrt{20}$$

$a=20$