

# Mini Test 03 - Circles, Binomial expansion, Graphs and Transformations / Graphs

## Question 1

June 2019 IAL P2 adapted

A circle  $C$  has equation

$$x^2 + y^2 + 4x - 10y - 21 = 0$$

- The point  $P(5, 4)$  lies on  $C$ .

Find the equation of the tangent to  $C$  at  $P$ , writing your answer in the form  $y = mx + c$ , where  $m$  and  $c$  are constants to be found.

[7]

## Question 2

June 2019 IAL P2 adapted

- (a) Find the first four terms, in ascending powers of  $x$ , of the binomial expansion of

$$\left(2 - \frac{1}{4}x\right)^6$$

[4]

- (b) Given that  $x$  is small, so terms in  $x^4$  and higher powers of  $x$  may be ignored, show

$$\left(2 - \frac{1}{4}x\right)^6 + \left(2 + \frac{1}{4}x\right)^6 = a + bx^2$$

where  $a$  and  $b$  are constants to be found.

[3]

### Question 3

Jan 2019 IAL P1 adapted

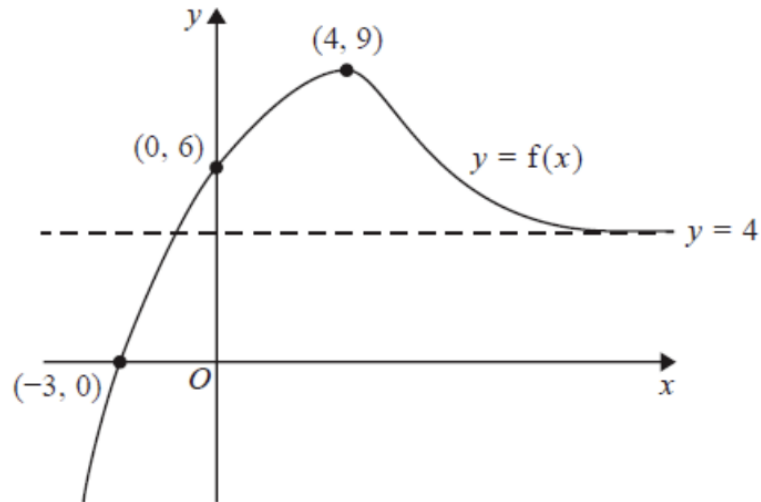


Figure 1

The curve  $C$  with equation  $y = f(x)$  is shown in Figure 1.  
The curve  $C$

- has a single turning point, a maximum at  $(4, 9)$
- crosses the coordinate axes at only two places,  $(-3, 0)$  and  $(0, 6)$
- has a single asymptote with equation  $y = 4$

(a) State the equation of the asymptote to the curve with equation  $y = f(-x)$ . [1]

(b) State the coordinates of the turning point on the curve with equation  $y = f\left(\frac{1}{4}x\right)$ . [1]

Given that the line with equation  $y = k$ , where  $k$  is constant, intersects  $C$  at exactly one point,

(c) State the possible values for  $k$ . [2]

The curve  $C$  is transformed to a new curve that passes through the origin.

(d) (i) Given that the new curve has equation  $y = f(x) - a$ , state the value of the constant  $a$ .  
(ii) Write down an equation for another single transformation of  $C$  that also passes through the origin. [2]