10 $f(x) = 2x^2 - 5x + 1$

The equation $f(x) = 0$ has roots α and β. Without solving the equation

(a) find the value of $\alpha^2 + \beta^2$

(3)

(b) show that $\alpha^4 + \beta^4 = \frac{433}{16}$

(2)

(c) form a quadratic equation with integer coefficients which has roots

$\left(\alpha^2 + \frac{1}{\alpha^2}\right)$ and $\left(\beta^2 + \frac{1}{\beta^2}\right)$

(7)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 12 marks)

11 $f(x) = x^3 + px^2 + qx + 6 \qquad p, q \in \mathbb{Z}$

Given that $f(x) = (x - 1)(x - 3)(x + r)$

(a) find the value of r.

(1)

Hence, or otherwise,

(b) find the value of p and the value of q.

(3)

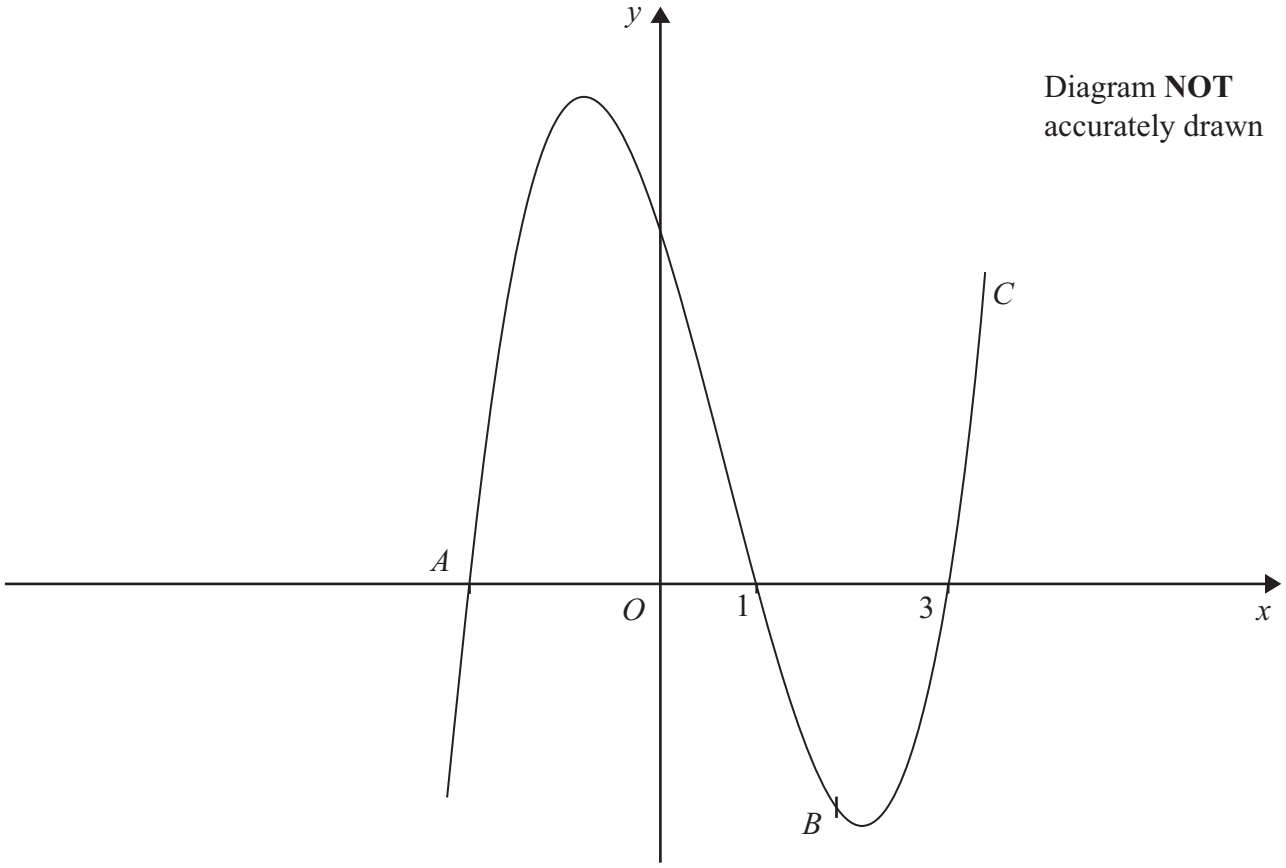

Figure 2

Figure 2 shows the curve C with equation $y = f(x)$ which crosses the x-axis at the points with coordinates (3, 0) and (1, 0) and at the point A. The point B on C has x-coordinate 2

(c) Find an equation of the tangent to C at B.

(5)

(d) Show that the tangent at B passes through A.

(2)

(e) Use calculus to find the area of the finite region bounded by C and the tangent at B.

(5)

Question 11 continued

Question 11 continued

Question 11 continued

Question 11 continued

(Total for Question 11 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS