Cubics - Past Edexcel Exam Questions

1. Factorise completely

$$x^3 - 4x^2 + 3x$$

[3]

. **Question 1 - Jan 2006**

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2. Given that $f(x) = (x^2 - 6x)(x - 2) + 3x$,

   (a) express $f(x)$ in the form $x(ax^2 + bx + c)$, where a, b and c are constants. [3]

   (b) Hence factorise $f(x)$ completely. [2]

   (c) Sketch the graph of $y = f(x)$, showing the coordinates of each point at which the graph meets the axes. [3]

Question 9 - May 2006

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3. (a) On the same axes sketch the graphs of the curves with equations

   i. $y = x^2(x - 2)$ [3]

   ii. $y = x(6 - x)$ [3]

   and indicate on your sketches the coordinates of all the points where the curves cross the x-axis.

   (b) Use algebra to find the coordinates of the points where the graphs intersect. [7]

Question 10 - Jan 2007

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4. The curve C has equation

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

   (a) Sketch C, showing clearly the coordinates of the points where the curve meets the coordinate axes. [4]

(b) Show that the equation of C can be written in the form

$$y = x^3 + x^2 - 5x + k,$$

where k is a positive integer, and state the value of k. [2]

There are two points on C where the gradient of the tangent to C is equal to 3.

(c) Find the x-coordinates of these two points. [6]

Question 10 - Jan 2008

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5. Factorise completely

$$x^3 - 9x$$

[3]

. **Question 2 - Jun 2008**

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6. The point $P(1, a)$ lies on the curve with equation $y = (x+1)^2(2-x)$.

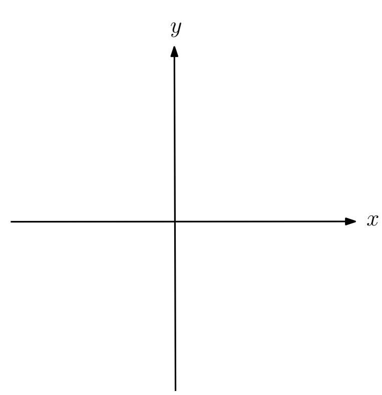
(a) Find the value of a. [1]

(b) On the axes below, sketch the curves with the following equations:

i. $y = (x+1)^2(2-x)$,

ii. $y = \frac{2}{x}$.

On your diagram show clearly the coordinates of any points at which the curves meet the axes. [5]



(c) With reference to your diagram in part (b), state the number of real solutions to the equation

$$(x+1)^2(2-x) = \frac{2}{x}$$

[1]

Question 8 - Jan 2009

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7. (a) Factorise completely $x^3 - 6x^2 + 9x$. [3]

(b) Sketch the curve with equation

$$y = x^3 - 6x^2 + 9x$$

showing the coordinates of the points at which the curve meets the x-axis. [4]

Using your answer to part (b), or otherwise,

(c) sketch, on a separate diagram, the curve with equation

$$y = (x-2)^2 - 6(x-2)^2 + 9(x-2)$$

showing the coordinates of the points at which the curve meets the x-axis. [2]

Question 10 - Jun 2009

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8. (a) Factorise completely $x^3 - 4x$. [3]

(b) Sketch the curve with equation

$$y = x^3 - 4x,$$

showing the coordinates of the points at which the curve meets the x-axis. [3]

The point A with x-coordinate -1 and the point B with x-coordinate 3 lie on the curve C.

(c) Find an equation of the line which passes through A and B, giving your answer in the form $y = mx + c$, where m and c are constants. [5]

(d) Show that the length of AB is $k\sqrt{10}$, where k is a constant to be found. [2]

Question 9 - Jan 2010

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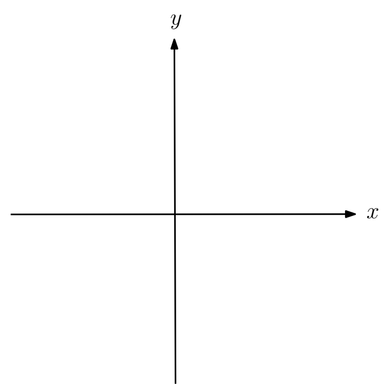
9. (a) On the axes below sketch the graphs of

   i. $y = x(4 - x)$,

   ii. $y = x^2(7 - x)$,

   showing clearly the coordinates of the points where the curves cross the coordinate axes. [5]



(b) Show that the x-coordinates of the points of intersection of

$$y = x(4 - x) \qquad \text{and} \qquad y = x^2(7 - x)$$

are given by the solutions to the equation $x\left(x^2 - 8x + 4\right) = 0$. [3]

The point A lies on both the curves and the x and y coordinates of A are both positive.

(c) Find the exact coordinates of A, leaving your answer in the form $\left(p + q\sqrt{3}, r + s\sqrt{3}\right)$, where p, q, r and s are integers. [7]

Question 10 - May 2010

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10. (a) Sketch the graphs of

   i. $y = x(x + 2)(3 - x)$,

   ii. $y = -\frac{2}{x}$,

   showing clearly the coordinates of all the point where the curves cross the coordinate axes. [6]

(b) Using your sketch state, giving a reason, the number of real solutions to the equation

$$x(x+2)(3-x)+\frac{2}{x}=0$$

[2]

Question 10 - Jan 2011

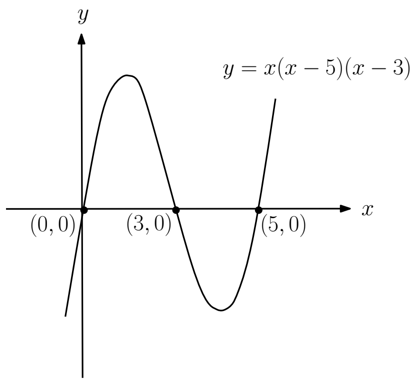
Solutions

1. $x(x-3)(x-1)$

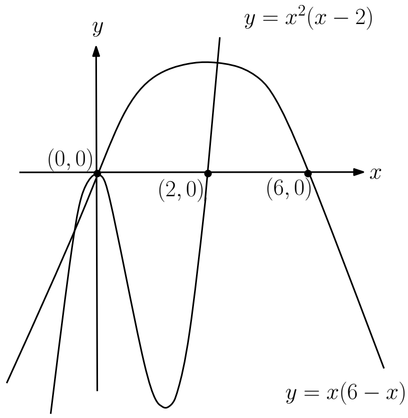
2. (a) $x\left(x^2-8x+15\right)$

   (b) $x(x-5)(x-3)$

   (c) .

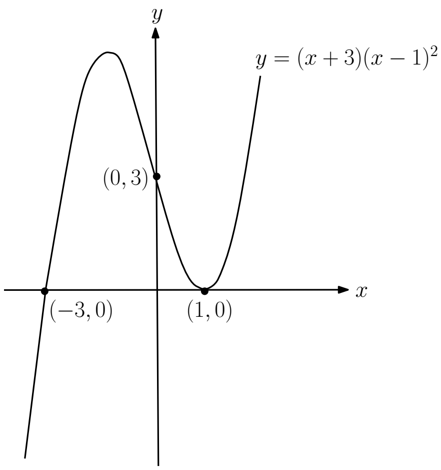


3. (a) .



   (b) (-2,-16), (3,9)

4. (a) .



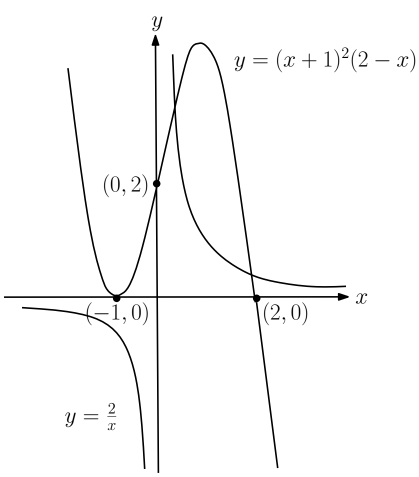
(b) $k = 3$

(c) $x = \frac{4}{3}$, $x = -2$

5. $x(x-3)(x+3)$

6. (a) $a = 4$

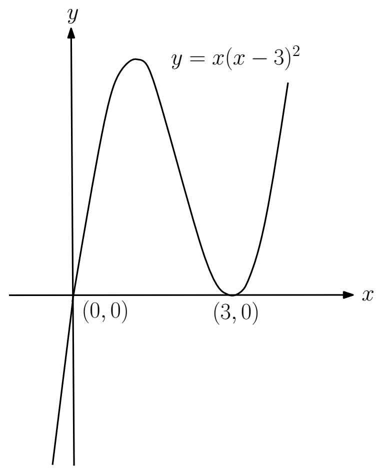
(b) .



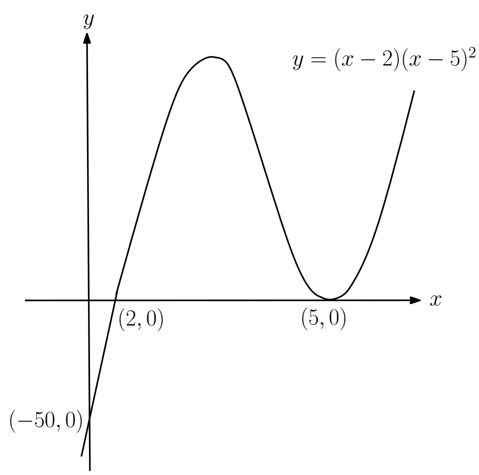
(c) The graphs intersect twice and so there are 2 solutions. We know they intersect twice since the point (1,4), on the reciprocal functions, lies above the point (1,2) on the cubic.

7. (a) $x(x-3)^2$

(b) .

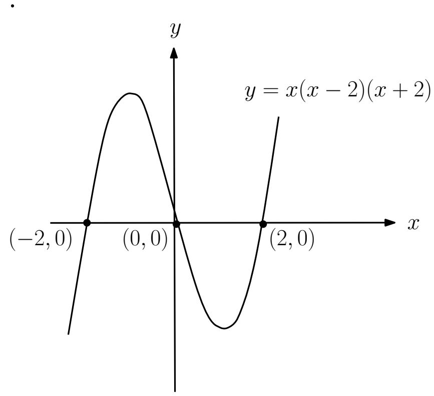


(c) .



8. (a) $x(x-2)(x+2)$

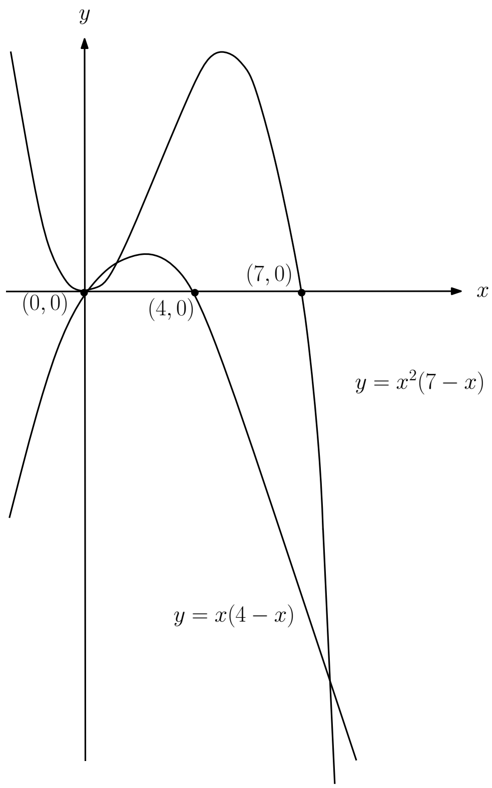
(b) .



(c) $y = 3x + 6$

(d) $k = 4$

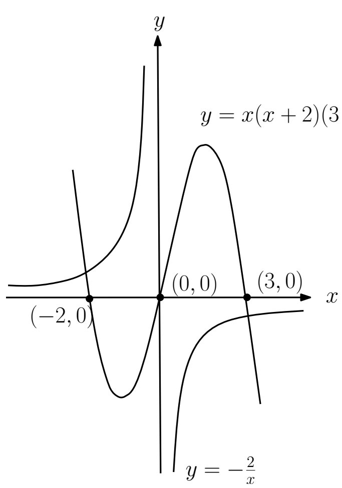
9. (a) .



(b) -

(c) $(4 - 2\sqrt{3}, 8\sqrt{3} - 12)$. Note that both $4 + 2\sqrt{3}$ and $4 - 2\sqrt{3}$ are both positive.

10. (a) .



(b) There are 2 solutions since the curves intersect twice.