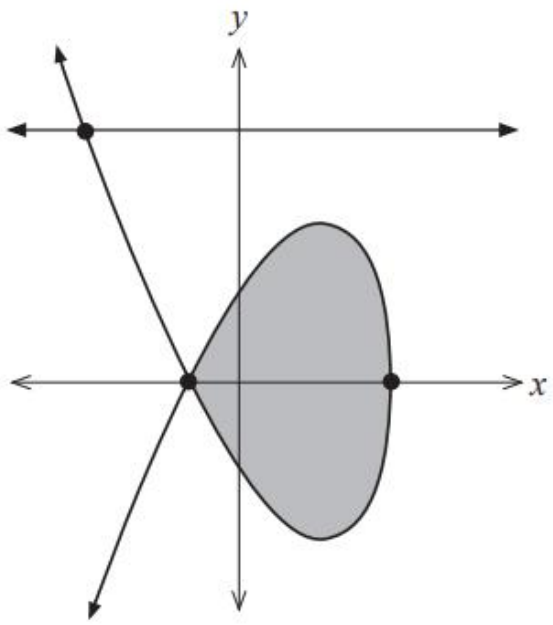
Question 13 **(8 marks)**

The equation $x^3 - x^2 - 5x = 3 - y^2$ implicitly defines the curve shown below. The line $y = \sqrt{24}$ intersects this curve as shown below.



It can be shown that the equation $x^3 - x^2 - 5x + 21 = 0$ will determine the intersection between the line $y = \sqrt{24}$ and the implicitly defined curve.

(a) Explain, with reference to the graph above, why we know that there is one real and two complex solutions (a conjugate pair) to this cubic equation. (2 marks)

(b) Determine the **two** exact complex solutions to the equation $x^3 - x^2 - 5x + 21 = 0$.
(2 marks)

(c) Calculate the area of the shaded region, correct to 0.001 square units. (4 marks)