This test is designed to check a learner's skills and knowledge in this topic. It should be completed without any outside assistance and should take no longer than 30 minutes. After completion, the mark scheme will help you decide what intervention is needed.

Write down all the stages in your working.

1 Find the set of values of p for which $2x^2 + px + (p-1) = 0$ has no real roots.

(Total for Question 1 is 6 marks)

2 The line l is perpendicular to the line with equation $3y - 6x + 1 = 0$ and passes through the point with coordinates $(-1, 2)$.

Find an equation for l in the form $ax + by - c = 0$.

(Total for Question 2 is 6 marks)

3 The curve C has equation $y = x^3 - 5x^2 + 5x + 4$.

(a) Find $\frac{dy}{dx}$ giving your answer in simplified form.

(3)

The points P and Q lie on C.
The gradient of C at P and Q is 2.
Given that the x-coordinate at P is $\frac{1}{3}$

(b) find the x-coordinate of Q

(5)

(c) hence find an equation of the tangent to C at Q.

(3)
(10)

4 Find $\int \left(2x^2 - \frac{1}{3x^2} + 8\right) \mathrm{d}x$ giving your answer in simplified form.

(5)