C1 Paper L – Marking Guide

1. $4x - 8 < 2x + 5$ M1

    $2x < 13, \qquad x < 6\tfrac{1}{2}$ M1 A1   **(3)**

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2. $f'(x) = -1 - 3x^2$ M1 A1

    $x^2 \geq 0$ for all real $x \implies -1 - 3x^2 \leq -1$ M1

    $\therefore f'(x) < 0 \implies f(x)$ is decreasing for all values of x A1   **(4)**

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3. *(i)* $y^2 - 9y + 8 = 0, \quad (y - 1)(y - 8) = 0$ M1

      $y = 1, 8$ A1

   (ii)   let $y = x^{\frac{3}{2}} \implies y^2 + 8 = 9y \qquad \therefore x^{\frac{3}{2}} = 1, 8$ B1

      $x = 1$ or $(\sqrt[3]{8})^2$ M1

      $x = 1$ or 4 A1   **(5)**

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4. *(i)* $y = \tfrac{1}{2}x^2 - \tfrac{3}{2}x^{-2}$ M1 A1

      $\dfrac{dy}{dx} = x + 3x^{-3}$ M1 A1

   (ii) $\dfrac{d^2y}{dx^2} = 1 - 9x^{-4} = \dfrac{x^4 - 9}{x^4}$ M1 A1   **(6)**

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5. $5x + y = 7 \implies y = 7 - 5x$ M1

    sub. into $3x^2 + y^2 = 21$

      $3x^2 + (7 - 5x)^2 = 21$ M1

      $2x^2 - 5x + 2 = 0$ A1

      $(2x - 1)(x - 2) = 0$ M1

      $x = \tfrac{1}{2}, 2$ A1

    $\therefore (\tfrac{1}{2}, \tfrac{9}{2})$ and $(2, -3)$ M1 A1   **(7)**

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6. *(i)* $= (\tfrac{49}{9})^{-\frac{1}{2}} = \sqrt{\tfrac{9}{49}} = \tfrac{3}{7}$ M1 A1

   (ii) $1 + x = \sqrt{3}\, x, \qquad 1 = x(\sqrt{3} - 1)$ M1

      $x = \dfrac{1}{\sqrt{3} - 1}$ A1

      $x = \dfrac{1}{\sqrt{3} - 1} \times \dfrac{\sqrt{3} + 1}{\sqrt{3} + 1} = \dfrac{\sqrt{3} + 1}{3 - 1} = \tfrac{1}{2} + \tfrac{1}{2}\sqrt{3}$ M2 A1   **(7)**

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7. *(i)*   grad $= \dfrac{-4 - 6}{1 - (-3)} = -\tfrac{5}{2}$ M1 A1

      $\therefore y - 6 = -\tfrac{5}{2}(x + 3)$ M1

      $2y - 12 = -5x - 15$

      $5x + 2y + 3 = 0$ A1

   (ii) $m: y = -\tfrac{2}{k}x - \tfrac{7}{k} \therefore$ grad $= -\tfrac{2}{k}$ M1 A1

      l and m perp. $\therefore -\tfrac{5}{2} \times -\tfrac{2}{k} = -1$ M1

      $k = -5$ A1   **(8)**

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8. *(i)* stretch by factor of 3 in *y*-direction about *x*-axis   B2
     or stretch by factor of 3 in *x*-direction about *y*-axis

(ii)

                                              B2
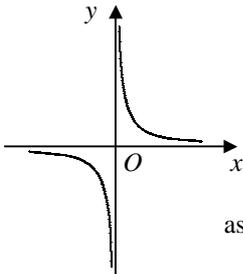
                 asymptotes: $x = 0$ and $y = 0$ B1

(iii) $\dfrac{3}{x} = c - 3x$

        $3 = cx - 3x^2$ M1

        $3x^2 - cx + 3 = 0$

        tangent ∴ equal roots, $b^2 - 4ac = 0$

        $(-c)^2 - (4 \times 3 \times 3) = 0$ M1 A1

        $c^2 = 36$

        $c = \pm 6$ A1   **(9)**

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9. *(i)* $(x - 6)^2 - 36 + (y + 4)^2 - 16 + 16 = 0$ M1
      ∴ centre $(6, -4)$ A1

(ii) $(x - 6)^2 + (y + 4)^2 = 36$ M1
      ∴ radius = 6   A1

(iii)
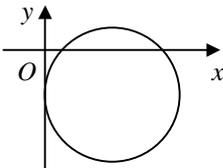
                                            B2

(iv) $y = 0$ ∴ $(x - 6)^2 + 16 = 36$ M1
             $x = 6 \pm \sqrt{20} = 6 \pm 2\sqrt{5}$ A1
      $AB = 6 + 2\sqrt{5} - (6 - 2\sqrt{5}) = 4\sqrt{5}$ M1 A1   **(10)**

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10. *(i)* $x^2 - 3x + 5 = 2x + 1$
        $x^2 - 5x + 4 = 0$ M1
        $(x - 1)(x - 4) = 0$ M1
        $x = 1, 4$ A1
        when $x = 1$, $y = 2(1) + 1 = 3$
        ∴ $P(1, 3)$, $Q(4, 9)$ A1

(ii) $\dfrac{dy}{dx} = 2x - 3$ M1

        grad = −1   A1
        ∴ $y - 3 = -(x - 1)$ [$y = 4 - x$]   M1 A1

(iii)   grad = 5
       ∴ $y - 9 = 5(x - 4)$ M1
         $y - 9 = 5x - 20$
         $y = 5x - 11$ A1

(iv) $4 - x = 5x - 11$ M1
       $x = \frac{5}{2}$ A1
       ∴ $(\frac{5}{2}, \frac{3}{2})$ A1   **(13)**

                                                           Total   **(72)**

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