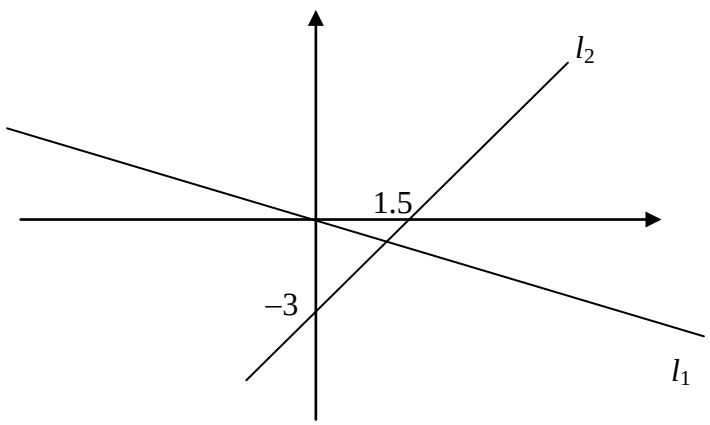
| Question number | | Scheme | Marks |
|---|---|---|---|
| **1.** | (a) | $k = 3$ | B1 (1) |
| | (b) | $(2^2)^x = (2^3)^{2-x}$ (A1 for $2x$ and $3(2-x)$) | M1 A1 |
| | | $2x = 3(2-x)$ $\quad 5x = 6$ $\quad x = 1.2$ | M1 A1 (4) |
| | | | **(5 marks)** |
| **2.** | (a) | $8 + 4\sqrt{7} - 2\sqrt{7} - 7 = 1 + 2\sqrt{7}$ | M1 A1 (2) |
| | (b) | $\frac{2+\sqrt{7}}{4+\sqrt{7}} \times \frac{4-\sqrt{7}}{4-\sqrt{7}} = \frac{1+2\sqrt{7}}{16-7}$ | M1 A1 ft |
| | | $c = \frac{1}{9}$ $\quad d = \frac{2}{9}$ | A1 (3) |
| | | | **(5 marks)** |
| **3.** | (a) | $\frac{dy}{dx} = 10 \times \frac{3}{2} x^{\frac{1}{2}} \left( = 15x^{\frac{1}{2}} \right)$ | M1 A1 (2) |
| | (b) | $7x + 4x^{\frac{5}{2}} + C$ | M1 A2(1,0) (3) |
| | | | **(5 marks)** |
| **4.** | (a) | $(x+k)^2 - 7 - k^2 = 0$ $\quad (x+k)^2$ (LHS) | M1 A1 |
| | | $\Rightarrow (x+k)^2 = 7 + k^2 = 0 \quad \therefore x + k = (\pm)\sqrt{7+k^2}$ | M1 (no need for ±) |
| | | $\therefore x = -k \pm \sqrt{7+k^2}$ | A1 (both) (4) |
| | (b) | $7 + k^2 > 0$ (or discriminant > 0) | M1 |
| | | $\therefore$ roots are real and distinct | A1 (2) |
| | (c) | $k = \sqrt{2} \Rightarrow x = -\sqrt{2} \pm \sqrt{7+2}$ | M1 |
| | | $x = -\sqrt{2} + 3$ or $-\sqrt{2} - 3$ | A1 (both) (2) |
| | | | **(8 marks)** |

| Question number | Scheme | Marks |
|---|---|---|
| **5.** (a) |  | B1 B1<br>B1 (3) |
| (b) | $-\frac{1}{4}x = 2x - 3$ $\frac{9}{4}x = 3$ $x = \frac{4}{3}$ $y = -\frac{1}{3}$ | M1 A1 A1 (3) |
| (c) | Perp. to $l_1$: $m = 4$<br>$y + \frac{1}{3} = 4(x - \frac{4}{3})$<br>$12x - 3y - 17 = 0$ | B1<br>M1<br>A1 (3)<br>**(9 marks)** |
| **6.** (a) | $a + (n - 1)d = 500 + 39 \times 50 = £2450$ | M1 A1 (2) |
| (b) | $\frac{1}{2}n\,(a + 1) = 20\,(500 + 2450) = £59000$ | M1 A1 ft (2) |
| (c) | Brian: $20\,(1780 + 39d) =$ (b)<br>Solve: $d = 30$ | M1 A1 ft<br>M1 A1 (4)<br>**(8 marks)** |

| Question number | | Scheme | | Marks | |
|---|---|---|---|---|---|
| **7.** | (a) | $\frac{5-(-3)}{8-2}=\frac{4}{3}$ | | M1 A1 | (2) |
| | (b) | *M*: $\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$ (5, 1) | | M1 A1 | |
| | | Gradient of CM is $-\frac{3}{4}$ | | B1 ft | |
| | | Equation of CM: $y-1=-\frac{3}{4}(x-5)$ | | M1 A1 | (5) |
| | | $(4y=-3x+19)$ | | | |
| | (c) | When $x = 4$, $y=\frac{7}{4}$ | | M1 A1 ft | (2) |
| | (d) | Radius = $\sqrt{(4-2)^2+\left(\frac{7}{4}+3\right)^2}$ | | M1 A1 ft | |
| | | $=\sqrt{4+\frac{361}{16}}=\sqrt{\frac{425}{16}}=\sqrt{\frac{25}{16}}\sqrt{17}=\frac{5\sqrt{17}}{4}$ | * | M1 A1 | (4) |
| | | | | **(13 marks)** | |
| **8.** | (a) | $2r^2h = 1030$, $h=\frac{515}{x^2}$ | | M1, A1 | (2) |
| | (b) | $A = 4x^2 + 6xh$ | | B1 | |
| | | $A = 4x^2 + \frac{3090}{x}$ | * | M1 A1 | (3) |
| | | | | **(5 marks)** | |