Worked Solutions

Edexcel C1 Paper E

1. (*a*) $x = 8$ **(1)**

(*b*) $x = 4$ **(1)**

(*c*) $x^4 = 81 \Rightarrow x = 3$ **(1)**

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2. (*a*) equal roots $\Rightarrow$ '$b^2 = 4ac$'

$$k^2 = 4 \times 25 = 100$$

$$k = \pm 10$$ **(2)**

(*b*) 2 distinct roots $\Rightarrow$ '$b^2 > 4ac$'

$k^2 > 100 \Rightarrow k > 10$ or $k < -10.$ **(2)**

(*c*) no real roots, $-10 < k < 10.$ **(2)**

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3. (*a*) $= \sqrt{9 \times 5} = 3\sqrt{5}.$ **(1)**

(*b*) $(3 - \sqrt{5})^2 = 9 + 5 - 6\sqrt{5}$

$= 14 - 6\sqrt{5}$ **(3)**

(*c*) $\mathrm{f}(x) = (4 + x + 4\sqrt{x}) + (1 + 4x - 4\sqrt{x})$

$= 5 + 5x$ **(3)**

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4. (*a*) $S_{10} = 910,$ using $S_n = \frac{n}{2}[2a + (n-1)d]$

$910 = \frac{10}{2}[2a + (10-1)(-2)]$

$91 = a - 9$

$a = 100$ **(3)**

(*b*) $S_n = 0$

$\frac{n}{2}[2 \times 100 + (n-1) \times (-2)] = 0$

$\Rightarrow 200 = 2(n-1)$

$n = 101$ **(4)**

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5. (*a*) $5x^2 - 3x - 2 = 0$

$(5x + 2)(x - 1) = 0$

$x = -\frac{2}{5}$ or 1 **(3)**

(*b*) $(3 - 2x)(2x^2 - x - 1) = 6x^2 - 3x - 3 - 4x^3 + 2x^2 + 2x$

$= -3 - x + 8x^2 - 4x^3.$ **(3)**

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6. (*a*) when $x = 2,$ $\frac{\mathrm{d}y}{\mathrm{d}x} = 4 \times 2 + \frac{4}{\sqrt{2}} = 8 + 2\sqrt{2}$ **(3)**

(*b*) integrating w.r.t. x, $y = 2x^2 + \left(4 \times 2 \times x^{\frac{1}{2}}\right) + c$

$y = 2x^2 + 8\sqrt{x} + c$

(*c*) passes through $(4, 50)$, $50 = 2 \times 4^2 + 8\sqrt{4} + c$

$c = 2$

$\therefore \mathrm{f}(x) = 2x^2 + 8\sqrt{x} + 2$ **(6)**

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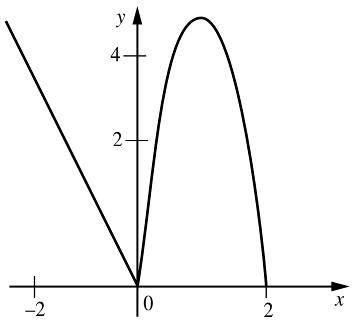
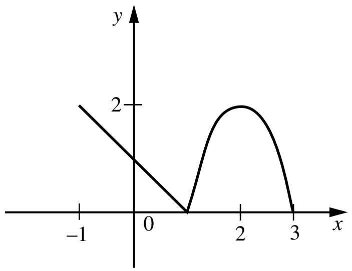
7. (*a*) (i) $y = 2\text{f}(x)$



(2)

(ii) $y = \text{f}(x-1)$



(2)

(*b*) Reflection in the y-axis (line $x = 0$). **(2)**

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8. (*a*) $p = 6, \ \ q = 0$ **(2)**

(*b*) gradient of $AC = \dfrac{12-6}{2-4} = -3. \ \therefore$ gradient of line $l = \dfrac{1}{3}$

equation of l is $y - 6 = \dfrac{1}{3}(x-4)$

or $x - 3y + 14 = 0$ **(5)**

(*c*) Solve sim. equations $x - 3y + 14 = 0, \ x + y = 12$

$$x = 5\tfrac{1}{2}, \quad y = 6\tfrac{1}{2}.$$

coordinates of N are $(5\tfrac{1}{2}, 6\tfrac{1}{2})$. **(2)**

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9. (*a*) integrating, $\text{f}(x) = 2x^3 - 2x^2 - 7x + c$

$(2, 4)$ lies on C, $4 = 16 - 8 - 14 + c \Rightarrow c = 10$

$$\therefore \text{f}(x) = 2x^3 - 2x^2 - 7x + 10$$ **(4)**

(*b*) when $x = 1$, $\text{f}(x) = 2 - 2 - 7 + 10 = 3$ **(2)**

(*c*) At P, $x = 2$, $\text{f}'(x) = (6 \times 4) - (4 \times 2) - 7$

$$\text{f}'(x) = 9$$

At Q, $\text{f}'(x) = 9$, $\therefore 6x^2 - 4x - 7 = 9$

Solving, $x = -\dfrac{4}{3}$ at Q **(5)**

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10. (*a*) $\dfrac{dy}{dx} = 6x^2 - 7 - \dfrac{4}{x^2}$

when $x = 1$, gradient $= 6 - 7 - 4 = -5$, as required **(2)**

(*b*) gradient of normal at $A = \dfrac{1}{5}$.

equation of normal at A is $y - (-1) = \dfrac{1}{5}(x-1)$

or $5y = x - 6$ **(4)**

(*c*) At P, $x = 0$. $\quad \therefore 5y = -6$

$$y = -\frac{6}{5}$$

coordinates of P are $\left(0, -\dfrac{6}{5}\right)$ **(1)**

(*d*) We have $6x^2 - 7 - \dfrac{4}{x^2} = -5$

$$6x^4 - 7x^2 - 4 = -5x^2 \quad (x \neq 0)$$

$$(3x^2 + 2)(x^2 - 1) = 0 \qquad x = 1, -1$$

Second point on curve has coordinates $(-1, 1)$ **(4)**
