C1 Paper B – Marking Guide

1. real and distinct roots $\therefore$ $b^2 - 4ac > 0$

$(-6)^2 - (4 \times 1 \times k) > 0$ M1

$36 - 4k > 0$

$k < 9$ M1 A1 **(3)**

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2. grad $AB = \frac{-2-0}{5-(-3)} = -\frac{1}{4}$ M1 A1

$\therefore\ y - 1 = -\frac{1}{4}(x - 4)$ M1

$4y - 4 = -x + 4$

$x + 4y = 8$ A1 **(4)**

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3. *(i)* $= \frac{18}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 6\sqrt{3}$ M1 A1

(ii) $= 4 - 2\sqrt{3} - 4\sqrt{3} + 6 = 10 - 6\sqrt{3}$ M1 A1 **(4)**

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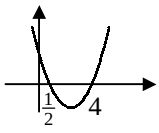
4. $(2x - 1)(x - 4) < 0$ M1

critical values: $\frac{1}{2}$, 4 A1



M1

$\frac{1}{2} < x < 4$ A1 **(4)**

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5. LHS $= 2x^4 + kx^3 + 7x^2 + 4x^3 + 2kx^2 + 14x - 6x^2 - 3kx - 21$ M1

$\therefore\ k + 4 = A$ M1

$7 + 2k - 6 = A$ A1

$\therefore\ k + 4 = 1 + 2k$ M1

$k = 3$ A1

$A = 7$ A1

$B = 14 - 3k = 5$ A1 **(7)**

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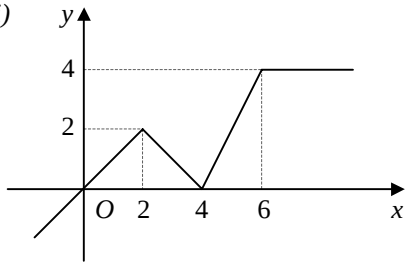
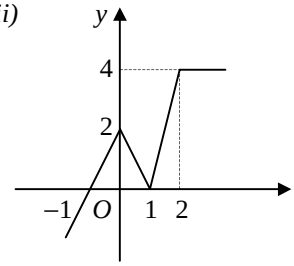
6. *(a)* *(i)* 3 B1

(ii) 1 B1

(b) *(i)*



(ii)



B3 B3 **(8)**

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7. *(i)* $= 3x^2 - 18x$ M1 A1

(ii) $= 6x - 18$ B1

(iii) for SP, $3x^2 - 18x = 0$ M1

$3x(x - 6) = 0$ M1

$x = 0, 6$

$\therefore$ (0, 0), (6, −108) A2

(iv) f″(0) = −18, f″(x) < 0 $\therefore$ (0, 0) maximum M1

f″(6) = 18, f″(x) > 0 $\therefore$ (6, −108) minimum A1 **(9)**

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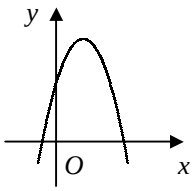
8. *(i)* $f(x) = 9 - [x^2 - 6x]$ M1
$= 9 - [(x-3)^2 - 9]$ M1
$= 18 - (x-3)^2$, $A = 18$, $B = -3$ A2

(ii) 18 B1

(iii) $18 - (x-3)^2 = 0$
$x - 3 = \pm\sqrt{18}$ M1
$x = 3 \pm 3\sqrt{2}$ M1 A1

(iv) 

B2

(10)

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9. *(i)* radius $= \sqrt{25+1} = \sqrt{26}$ M1 A1
$\therefore\ (x+3)^2 + (y-2)^2 = (\sqrt{26})^2$ M1
$(x+3)^2 + (y-2)^2 = 26$ A1

(ii) $(-4, 7)$, LHS $= (-4+3)^2 + (7-2)^2 = 1 + 25 = 26$ $\therefore$ lies on circle B1

(iii) grad of radius $= \frac{7-2}{-4-(-3)} = -5$ M1

$\therefore$ grad of tangent $= \frac{-1}{-5} = \frac{1}{5}$ M1 A1

$\therefore\ y - 7 = \frac{1}{5}(x+4)$ M1

$5y - 35 = x + 4$
$x - 5y + 39 = 0$ A1 **(10)**

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10. *(i)* $y = x - 6\sqrt{x} + 9$ M1 A1

$\frac{dy}{dx} = 1 - 3x^{-\frac{1}{2}} = 1 - \frac{3}{\sqrt{x}}$ M1 A1

(ii) $x = 4\ \therefore\ y = 1$ B1

grad of tangent $= 1 - \frac{3}{2} = -\frac{1}{2}$ M1

grad of normal $= \frac{-1}{-\frac{1}{2}} = 2$ A1

$\therefore\ y - 1 = 2(x-4)$ M1
$y = 2x - 7$ A1

(iii) at intersect: $x - 6\sqrt{x} + 9 = 2x - 7$
$x + 6\sqrt{x} - 16 = 0$ M1
$(\sqrt{x} + 8)(\sqrt{x} - 2) = 0$ M1
$\sqrt{x} = -8, 2$ A1

$\sqrt{x} = 2 \Rightarrow x = 4$ (at P)
$\sqrt{x} = -8 \Rightarrow$ no real solutions $\therefore$ normal does not intersect again A1 **(13)**

Total **(72)**