| | | | | | | |
|---|---|---|---|---|---|---|
| **22** | (a) | $\left(\frac{dy}{dx} =\right) 2x + px^{-2}$ oe | | 4 | M2 | Both terms correct<br>(M1 for one term correct) |
| | | $2(-3) + p(-3)^{-2} (= 0)$ | | | M1 | (dep on M1) substitute $-3$ into a derivative of the form $ax + bx^{-2}$ |
| | | | 54 | | A1 | |
| | (b) | $\left(\frac{dy}{dx} =\right) 2x + 16x^{-2} = 0$ | | 3 | M1 | set $\frac{dy}{dx} = 0$, at least one term correct |
| | | eg $2x^3 + 16 = 0$ **or** $2x^3 = -16$ **or** $x^3 = -8$ **or** $x = \sqrt[3]{-8}$ **or** $x = -2$ | | | M1 | rearrangement of the correct equation to remove the negative power of $x$ |
| | | | 12 | | A1 | |
| | | | | | | **Total 7 marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **23** | (a) | $2(x^2 - 6x) + 3$ **or** $2(x^2 - 6x + \frac{3}{2})$ | | 3 | M1 | **or** for one of $a$, $b$ or $c$ correct<br>**OR** expanding $a(x^2 + 2bx + b^2) + c$ |
| | | $2\left[(x-3)^2 - 9\right] + 3$ **or** $2\left[(x-3)^2 - 3^2 + \frac{3}{2}\right]$ oe | | | M1 | **or** for two of $a$, $b$ or $c$ correct<br>**OR** $-12 = 2ab$ **or** $3 = ab^2 + c$ |
| | | | $2(x-3)^2 - 15$ | | A1 | accept $a = 2$, $b = -3$, $c = -15$ |
| | (b) | | $(-1, -15)$ | 2 | B2ft | eg accept [their $-b - 4$] for the $x$-coordinate or [their $c$] for the $y$-coordinate<br>(B1 ft for one correct coordinate) |
| | | | | | | **Total 5 marks** |