

| 4(a) | $y=(x+2)^{2}+3$ | $[1]$ |
| :--- | :---: | :--- |
|  | $x=-2, y=3$ | $[1]$ |
| 4(b) | $y=3\left(x^{2}+12 x+33\right)$ | $[1]$ |
|  | $x=3\left[(x+6)^{2}-3\right]=3(x+6)^{2}-9$ | $[1]$ |
| 4(c) | $y=2\left(x^{2}+\frac{7}{2} x-5\right)$ | $[1]$ |
|  | $=2\left[\left(x+\frac{7}{4}\right)^{2}-\frac{129}{16}\right]=2\left(x+\frac{7}{4}\right)^{2}-\frac{129}{8}$ | $[1]$ |
| $x=-\frac{7}{4}, y=-\frac{129}{8}$ | $[1]$ |  |


| 5(a) |  | [1] Smooth connecting curve using line of symmetry |
| :---: | :---: | :---: |
| 5(b) | $x=-1, y=2 \pm 0.25$ | [1] |
| 6(a) | $f g(x)=x^{2}-4$ | [1] Correct function given |
|  | Graph of $x^{2}$ has turning point $(0,0)$ <br> $f g(x)=x^{2}-4$ is the graph of $x^{2}$ but moved down 4, <br> so that is how the turning point has moved too. <br> The $x$ stays the same, but the $y$ goes down by 4 . $x=0, y=-4$ | [1] |
| 6(b) | $g f(x)=(x-4)^{2}$ | [1] Correct function given |
|  | Graph of $x^{2}$ has turning point $(0,0)$ $g f(x)=(x-4)^{2}$ is the graph of $x^{2}$ but moved right 4, so that is how the turning point has moved too. The $x$ increased by 4 , but the $y$ stays the same. $x=4, y=0$ | [1] |
| 6(c) | The turning point of $f g(x)$ is where $f(x)$ intercepts the $y$-axis. <br> The turning point of $g f(x)$ is where $f(x)$ intercepts the $x$-axis. | [1] For either or both correct comments |

