## Completing the Square

1. Express each of the following in the form $(x+a)^{2}+b$
(a) $x^{2}+6 x-1$
(b) $x^{2}+10 x-5$
(c) $x^{2}-2 x+7$
(d) $x^{2}-12 x+3$
(e) $x^{2}-10 x+6$
(f) $x^{2}-3 x-4$
(g) $x^{2}-7 x-3$
2. Express each of the following in the form $a(x+b)^{2}+c$
(a) $2 x^{2}+8 x+7$
(b) $3 x^{2}-18 x+1$
(c) $4 x^{2}+8 x-5$
(d) $3 x^{2}-24 x-2$
(e) $2 x^{2}-12 x-1$
(f) $5-4 \mathrm{x}-\mathrm{x}^{2}$
(g) $10-6 x-x^{2}$
(h) $3 x^{2}-9 x+2$
(i) $2 x^{2}-5 x-1$
3. (a) $f(x)=x^{2}-6 x+11$. Express $f(x)$ in the form $f(x)=(x+a)^{2}+b$.
(b) Hence sketch the graph of $f(x)$ showing clearly where it cuts the y -axis and its turning point.
4. (a) Express $y=x^{2}-10 x+1$ in the form $y=(x+a)^{2}+b$.
(b) Hence sketch the graph of y showing clearly where it cuts the y -axis and its turning point.
5. (a) $f(x)=3 x^{2}-18 x-2$. Express $f(x)$ in the form $f(x)=a(x+b)^{2}+c$.
(b) Hence sketch the graph of $f(x)$ showing clearly where it cuts the $\mathrm{y}-\mathrm{axis}$ and its turning point, stating whether it is a maximum or minimum.
6. (a) Express $y=10-2 x-x^{2}$ in the form $y=a(x+b)^{2}+c$.
(b) Hence sketch the graph of y showing clearly where it cuts the $y$-axis and its turning point, , stating whether it is a maximum or minimum.
7. (a) Express $5-8 x-2 x^{2}$ in the form $a(x+b)^{2}+c$.
(b) Hence sketch the graph of $y=5-8 x-2 x^{2}$ showing clearly where it cuts the $\mathrm{y}-\mathrm{axis}$ and its turning point.
8. (a) Express $f(x)=(2 x-1)(2 x+5)$ in the form $f(x)=a(x+b)^{2}+c$.
(b) Hence sketch the graph of $f(x)$ showing clearly where it cuts the y -axis and its turning point.
9. (a) Express $f(x)=x^{2}-4 x+5$ in the form $f(x)=(x-a)^{2}+b$.
(b) On the same diagram sketch
(i) $y=f(x)$
(ii) $y=10-f(x)$
10. (a) Express $f(x)=1-6 x-x^{2}$ in the form $f(x)=a(x+b)^{2}+c$
(b) Sketch on separate diagrams
(i) $y=f(x)$
(ii) $y=f(-x)-1$
11. (a) Express $x^{2}+2 x+9$ in the form $(x+a)^{2}+b$.
(b) Hence state the maximum value of $\frac{16}{x^{2}+2 x+9}$.
12. (a) Express $x^{2}+6 x+10$ in the form $(x+a)^{2}+b$.
(b) Hence state the maximum value of $\frac{24}{x^{2}+6 x+10}$.
13. (a) Express $x^{2}+8 x+20$ in the form $(x+a)^{2}+b$.
(b) Hence state the maximum value of $\frac{2}{x^{2}+8 x+20}$.
