[06-09-20-T11-B]

Completing the Square

■ **Please do this assignment on other sheets of paper, not on this sheet. Show your work.**

■ **Rewrite each function in the form $f(x) = a(x + h)^2 + k$**

[1] $f(x) = 3x^2 + x + 6$

[2] $f(x) = 3x^2 - x + 6$

[3] $f(x) = -3x^2 - x + 6$

[4] $f(x) = -3x^2 - 6x + 7$

[5] $f(x) = 2x^2 - 5x + 9$

[6] $f(x) = 2x^2 - \pi x + 9$

[7] $f(x) = \sqrt{2}\ x^2 - 2x + 9$

Answers

[1] $f(x) = 3x^2 + x + 6$ $\quad$ f (x) = 3 $(x + \frac{1}{6})^2 + 5\ \frac{33}{36}$

[2] $f(x) = 3x^2 - x + 6$

$$f(x) = 3\left(x - \frac{1}{6}\right)^2 + 6\ \frac{1}{12}$$

[3] $f(x) = -3x^2 - x + 6$

$$f(x) = -3\left(x + \frac{1}{6}\right)^2 + 6\ \frac{1}{12}$$

[4] $f(x) = -3x^2 - 6x + 7$

$$\begin{aligned} f(x) &= -3\,(x^2 + 2x) + 7 \\ &= -3\,(x^2 + 2x + 1) + 7 + 3 \\ &= -3\,(x + 1)^2 + 11 \end{aligned}$$

[5] $f(x) = 2x^2 - 5x + 9$

$$\begin{aligned} f(x) &= 2\left(x^2 - \frac{5}{2}x\right) + 9 \\ &= 2\left(x^2 - \frac{5}{2}x + \frac{25}{4}\right) + 9 - \frac{25}{2} \\ &= 2\left(x - \frac{5}{2}\right)^2 - 3\ \frac{1}{2} \end{aligned}$$

[6] $f(x) = 2x^2 - \pi x + 9$

$$\begin{aligned} f(x) &= 2\left(x^2 - \frac{\pi}{2}x\right) + 9 \\ &= 2\left(x^2 - \frac{\pi}{2}x + \frac{\pi^2}{4}\right) + 9 - \frac{\pi^2}{2} \\ &= 2\left(x - \frac{\pi}{2}\right)^2 + \frac{18 - \pi^2}{2} \end{aligned}$$

[7] $f(x) = \sqrt{2}\ x^2 - 2x + 9$

$$\begin{aligned} f(x) &= \sqrt{2}\ \left(x^2 - \sqrt{2}\,x\right) + 9 \\ &= \sqrt{2}\ \left(x^2 - \sqrt{2}\,x + \frac{1}{2}\right) + 9 - \frac{\sqrt{2}}{2} \\ &= \sqrt{2}\ \left(x^2 - \frac{\sqrt{2}}{2}\right)^2 + \frac{18 - \sqrt{2}}{2} \end{aligned}$$