

## General to Standard Form by Completing the Square

Change each of the following to Standard Form and state the vertex.

1)  $f(x) = -x^2 + 2x + 2$

$$f(x) = \underline{\underline{-}}(x^2 - 2x + \underline{\underline{1}}) + \underline{\underline{2}} + \underline{\underline{1}}$$

$$f(x) = -(x-1)^2 + 3$$

2)  $f(x) = x^2 + 4x + 5$

$$f(x) = (x^2 + 4x + 4) + 5 - 4$$

$$f(x) = (x+2)^2 + 1$$

$$f(x) = (x+2)^2 + 1$$

3)  $f(x) = -3x^2 - 24x - 47$

$$f(x) = -3(x^2 + 8x + 16) - 47 - (-3)(16)$$

$$f(x) = -3(x+4)^2 + 1$$

4)  $f(x) = \frac{1}{4}x^2 - 2x$

$$f(x) = \frac{1}{4}(x^2 - 8x + 16) - \frac{1}{4}(16)$$

$$f(x) = \frac{1}{4}(x-4)^2 - 4$$

$$5) f(x) = \frac{1}{2}x^2 + 2x + 1$$

$$f(x) = \frac{1}{2}(x^2 + 4x + 4) + 1 - \frac{1}{2}(4)$$

$$f(x) = \frac{1}{2}(x+2)^2 - 1$$

$$6) f(x) = x^2 + 6x + 10$$

$$f(x) = (x^2 + 6x + 9) + 10 - 9$$

$$f(x) = (x+3)^2 + 1$$

$$7) f(x) = -x^2 + 2x$$

$$f(x) = -(x^2 - 2x + 1) + 1$$

$$f(x) = -(x-1)^2 + 1$$

$$8) f(x) = -x^2 + 8x - 20$$

$$f(x) = -(x^2 - 8x + 16) - 20 + 16$$

$$f(x) = -(x-4)^2 - 4$$

$$9) f(x) = 2x^2 - 8x + 9$$

$$f(x) = 2(x^2 - 4x + 4) + 9 - 8$$

$$f(x) = 2(x-2)^2 + 1$$

$$10) f(x) = -2x^2 - 16x - 36$$

$$f(x) = -2(x^2 + 8x + 16) - 36 + 32$$

$$f(x) = -2(x+4)^2 - 4$$

$$11) f(x) = -x^2 + 7x - 16$$

$$f(x) = -\left(x^2 - 7x + \frac{49}{4}\right) - 16 + \frac{49}{4}$$

$$f(x) = -\left(x - \frac{7}{2}\right)^2 - \frac{64 + 49}{4}$$

$$f(x) = -\left(x - \frac{7}{2}\right)^2 - \frac{15}{4}$$

$$12) f(x) = -2x^2 + 2x - 4$$

$$f(x) = -2\left(x^2 - x + \frac{1}{4}\right) - 4 + \frac{1}{2}$$

$$f(x) = -2\left(x - \frac{1}{2}\right)^2 - \frac{7}{2}$$

$$13) f(x) = x^2 + 5x + 4$$

$$f(x) = \left(x^2 + 5x + \frac{25}{4}\right) + 4 - \frac{25}{4}$$

$$f(x) = \left(x + \frac{5}{2}\right)^2 - \frac{9}{4}$$

$$14) f(x) = -2x^2 + 10x - 9$$

$$f(x) = -2\left(x^2 - 5x + \frac{25}{4}\right) - 9 + 2\left(\frac{25}{4}\right)$$

$$f(x) = -2\left(x - \frac{5}{2}\right)^2 + \frac{7}{2}$$

$$15) f(x) = x^2 - x - \frac{7}{4}$$

$$f(x) = \left(x^2 - x + \frac{1}{4}\right) - \frac{7}{4} - \frac{1}{4}$$

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

$$16) f(x) = -2x^2 + 2x - 3$$

$$f(x) = -2\left(x^2 - x + \frac{1}{4}\right) - 3 + 2\left(\frac{1}{4}\right)$$

$$f(x) = -2\left(x - \frac{1}{2}\right)^2 - \frac{5}{2}$$

$$17) f(x) = x^2 - 3x + \frac{21}{4}$$

$$f(x) = \left(x^2 - 3x + \frac{9}{4}\right) + \frac{21}{4} - \frac{9}{4}$$

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

$$18) f(x) = x^2 + 3x + \frac{1}{4}$$

$$f(x) = \left(x^2 + 3x + \frac{9}{4}\right) + \frac{1}{4} - \frac{9}{4}$$

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

$$19) f(x) = x^2 - 5x + \frac{13}{4}$$

$$= \left(x^2 - 5x + \frac{25}{4}\right) + \frac{13}{4} - \frac{25}{4}$$

$$f(x) = \left(x - \frac{5}{2}\right)^2 - 3$$

$$20) f(x) = \frac{1}{2}x^2 + \frac{3}{2}x + 5$$

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

$$f(x) = \frac{1}{2} \left(x + \frac{3}{2}\right)^2 + \frac{40 - 9}{8}$$

$$f(x) = \frac{1}{2} \left(x + \frac{3}{2}\right)^2 + \frac{31}{8}$$