Worksheet

08/08/2020

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Problem quickname: 9004

<u>1)</u>

Determine the vertex of the quadratic function. In order to do this, complete the square.

a) Function: $\qquad$ $7x^2 - 126x + 574$
    Factor out the leading coefficient 7: $7(x^2 - 18x) + 574$
    Complete the square: $7(x^2 - 18x + 81 - 81) + 574$
    Form square: $7((x-9)^2 - 81) + 574$
    Multiply out: $7(x-9)^2 - 567 + 574$
    Convert to vertex form: $7(x-9)^2 + 7$
    Vertex: $(9|7)$

b) Function: $\qquad$ $2x^2 + 20x + 47$
    Factor out the leading coefficient 2: $2(x^2 + 10x) + 47$
    Complete the square: $2(x^2 + 10x + 25 - 25) + 47$
    Form square: $2((x+5)^2 - 25) + 47$
    Multiply out: $2(x+5)^2 - 50 + 47$
    Convert to vertex form: $2(x+5)^2 - 3$
    Vertex: $(-5|-3)$

c) Function: $\qquad$ $3x^2 - 60x + 308$
    Factor out the leading coefficient 3: $3(x^2 - 20x) + 308$
    Complete the square: $3(x^2 - 20x + 100 - 100) + 308$
    Form square: $3((x-10)^2 - 100) + 308$
    Multiply out: $3(x-10)^2 - 300 + 308$
    Convert to vertex form: $3(x-10)^2 + 8$
    Vertex: $(10|8)$

d) Function: $\qquad$ $3x^2 + 24x + 42$
    Factor out the leading coefficient 3: $3(x^2 + 8x) + 42$
    Complete the square: $3(x^2 + 8x + 16 - 16) + 42$
    Form square: $3((x+4)^2 - 16) + 42$
    Multiply out: $3(x+4)^2 - 48 + 42$
    Convert to vertex form: $3(x+4)^2 - 6$
    Vertex: $(-4|-6)$

e) Function: $\qquad$ $8x^2 + 96x + 285$
    Factor out the leading coefficient 8: $\quad 8(x^2 + 12x) + 285$
    Complete the square: $\qquad 8(x^2 + 12x + 36 - 36) + 285$
    Form square: $\qquad 8((x + 6)^2 - 36) + 285$
    Multiply out: $\qquad 8(x + 6)^2 - 288 + 285$
    Convert to vertex form: $\qquad 8(x + 6)^2 - 3$
    Vertex: $\qquad (-6|-3)$

f) Function: $\qquad$ $5x^2 + 70x + 253$
    Factor out the leading coefficient 5: $\quad 5(x^2 + 14x) + 253$
    Complete the square: $\qquad 5(x^2 + 14x + 49 - 49) + 253$
    Form square: $\qquad 5((x + 7)^2 - 49) + 253$
    Multiply out: $\qquad 5(x + 7)^2 - 245 + 253$
    Convert to vertex form: $\qquad 5(x + 7)^2 + 8$
    Vertex: $\qquad (-7|8)$

<u>2)</u>

Determine the vertex of the quadratic function.

a) Function: $\qquad$ $4x^2 + 80x + 394$
    Factor out the leading coefficient 4: $\quad 4(x^2 + 20x) + 394$
    Complete the square: $\qquad 4(x^2 + 20x + 100 - 100) + 394$
    Form square: $\qquad 4((x + 10)^2 - 100) + 394$
    Multiply out: $\qquad 4(x + 10)^2 - 400 + 394$
    Convert to vertex form: $\qquad 4(x + 10)^2 - 6$
    Vertex: $\qquad (-10|-6)$

b) Function: $\qquad$ $9x^2 - 54x + 85$
    Factor out the leading coefficient 9: $\quad 9(x^2 - 6x) + 85$
    Complete the square: $\qquad 9(x^2 - 6x + 9 - 9) + 85$
    Form square: $\qquad 9((x - 3)^2 - 9) + 85$
    Multiply out: $\qquad 9(x - 3)^2 - 81 + 85$
    Convert to vertex form: $\qquad 9(x - 3)^2 + 4$
    Vertex: $\qquad (3|4)$

c) Function: $\qquad$ $5x^2 - 90x + 414$
    Factor out the leading coefficient 5: $\quad 5(x^2 - 18x) + 414$
    Complete the square: $\qquad 5(x^2 - 18x + 81 - 81) + 414$
    Form square: $\qquad 5((x - 9)^2 - 81) + 414$
    Multiply out: $\qquad 5(x - 9)^2 - 405 + 414$
    Convert to vertex form: $\qquad 5(x - 9)^2 + 9$
    Vertex: $\qquad (9|9)$

d) Function: $\qquad$ $8x^2 + 128x + 511$
    Factor out the leading coefficient 8: $\quad 8(x^2 + 16x) + 511$
    Complete the square: $\qquad 8(x^2 + 16x + 64 - 64) + 511$
    Form square: $\qquad 8((x + 8)^2 - 64) + 511$
    Multiply out: $\qquad 8(x + 8)^2 - 512 + 511$
    Convert to vertex form: $\qquad 8(x + 8)^2 - 1$
    Vertex: $\qquad (-8| -1)$

e) Function: $\qquad$ $4x^2 + 32x + 62$
    Factor out the leading coefficient 4: $\quad 4(x^2 + 8x) + 62$
    Complete the square: $\qquad 4(x^2 + 8x + 16 - 16) + 62$
    Form square: $\qquad 4((x + 4)^2 - 16) + 62$
    Multiply out: $\qquad 4(x + 4)^2 - 64 + 62$
    Convert to vertex form: $\qquad 4(x + 4)^2 - 2$
    Vertex: $\qquad (-4| -2)$

f) Function: $\qquad$ $10x^2 - 120x + 351$
    Factor out the leading coefficient 10: $\quad 10(x^2 - 12x) + 351$
    Complete the square: $\qquad 10(x^2 - 12x + 36 - 36) + 351$
    Form square: $\qquad 10((x - 6)^2 - 36) + 351$
    Multiply out: $\qquad 10(x - 6)^2 - 360 + 351$
    Convert to vertex form: $\qquad 10(x - 6)^2 - 9$
    Vertex: $\qquad (6| -9)$

3)

Quick: 9004

Determine the vertex of the quadratic function. In order to do this, complete the square.

a) Function: $x^2 + 8x + 14$, Vertex: $(-4| -2)$
b) Function: $x^2 + 6x + 3$, Vertex: $(-3| -6)$
c) Function: $x^2 + 4x + 11$, Vertex: $(-2|7)$
d) Function: $x^2 + 12x + 30$, Vertex: $(-6| -6)$
e) Function: $x^2 + 16x + 60$, Vertex: $(-8| -4)$
f) Function: $x^2 + 8x + 22$, Vertex: $(-4|6)$

4)

Quick: 9004

Determine the vertex of the quadratic function. In order to do this, complete the square.

a) Function: $\qquad$ $x^2 + 4x - 2$
    Complete the square: $\qquad x^2 + 4x + 4 - 4 - 2$
    Form square: $\qquad (x + 2)^2 - 4 - 2$
    Convert to vertex form: $\qquad (x + 2)^2 - 6$
    Vertex: $\qquad (-2| -6)$

b) Function: $x^2 + 14x + 46$
Complete the square: $x^2 + 14x + 49 - 49 + 46$
Form square: $(x + 7)^2 - 49 + 46$
Convert to vertex form: $(x + 7)^2 - 3$
Vertex: $(-7| - 3)$

c) Function: $x^2 + 4x + 6$
Complete the square: $x^2 + 4x + 4 - 4 + 6$
Form square: $(x + 2)^2 - 4 + 6$
Convert to vertex form: $(x + 2)^2 + 2$
Vertex: $(-2|2)$

d) Function: $x^2 + 6x$
Complete the square: $x^2 + 6x + 9 - 9$
Form square: $(x + 3)^2 - 9$
Convert to vertex form: $(x + 3)^2 - 9$
Vertex: $(-3| - 9)$

e) Function: $x^2 + 20x + 96$
Complete the square: $x^2 + 20x + 100 - 100 + 96$
Form square: $(x + 10)^2 - 100 + 96$
Convert to vertex form: $(x + 10)^2 - 4$
Vertex: $(-10| - 4)$

f) Function: $x^2 + 6x - 1$
Complete the square: $x^2 + 6x + 9 - 9 - 1$
Form square: $(x + 3)^2 - 9 - 1$
Convert to vertex form: $(x + 3)^2 - 10$
Vertex: $(-3| - 10)$

Good Luck!