5 ❦ Quadratic functions

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1 For each of the following parabolas, find the vertex.

a) $y = -2x^2 + 8x - 5$

b) $y = 3x^2 + 2x + 1$

c) $y = 4 - 2x + \dfrac{1}{2}x^2$

2 For each of the following functions, find the maximum and minimum values when x varies within the domain indicated in ( ). Also, find the value of x at which the function attains its maximum and minimum.

a) $y = -x^2 - 2x - 5 \quad (-2 \leqq x \leqq 2)$

b) $y = 2x^2 + 3x - 1 \quad (-1 \leqq x \leqq 2)$

3 Solve the following equations over the complex numbers.

a) $2x^2 + 3x - 1 = 0$

b) $3x^2 - 5x + 9 = 0$

c) $x^2 - 2x + 2 = 0$

d) $4x(x + 5) = -25$

e) $\dfrac{x^2}{2} + \dfrac{2x}{3} + \dfrac{1}{3} = 0$

4 Solve the following inequalities.

a) $2x^2 + x - 6 > 0$

b) $2x^2 - 3x - 2 \leqq 0$

c) $2(x^2 - x) < 3(x + 1)$

d) $x^2 + x - 1 < 0$

e) $4x^2 - 4x + 1 > 0$

f) $2x^2 - 3x + 2 < 0$

5 There is a rectangle whose vertical length is 1cm longer than the horizontal length. When the area is 21cm^2, what is the length of the vertical side and the horizontal side, respectively.

6 A rocket is launched in the air. Its height, in meters above sea level, as a function of time, in seconds, is given by $h(t) = -4.9t^2 + 147t - 602.5$. Find the maximum height the rocket attains.