

Section 2.1

Polynomial Function

Let n be a nonnegative integer and let $a_n, a_{n-1}, \dots, a_2, a_1, a_0$ be real numbers with $a_n \neq 0$. The function given by

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$$

is called a polynomial function of x with degree n .

Quadratic Function

Let a, b , and c be real numbers with $a \neq 0$. The function given by

$$f(x) = ax^2 + bx + c$$

is called a quadratic function.

Standard Form of a Quadratic Function

The quadratic function given by

$$f(x) = a(x - h)^2 + k, \quad a \neq 0$$

is in standard form.

The vertex of the parabola is the point (h, k) .

The axis of symmetry of the parabola is the line $x = h$.

If $a > 0$, the parabola opens upward, and if $a < 0$, the parabola opens downward.

Vertex of a Parabola

The vertex of a graph of $f(x) = ax^2 + bx + c$ is $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$.

- If $a > 0$, the parabola has a *minimum* at $x = -\frac{b}{2a}$.
- If $a < 0$, the parabola has a *maximum* at $x = -\frac{b}{2a}$.

Problem 1. Sketch the graph of the quadratic function. Identify the vertex, axis of symmetry, and x -intercept(s).

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

b) $h(x) = (x - 6)^2 + 3$

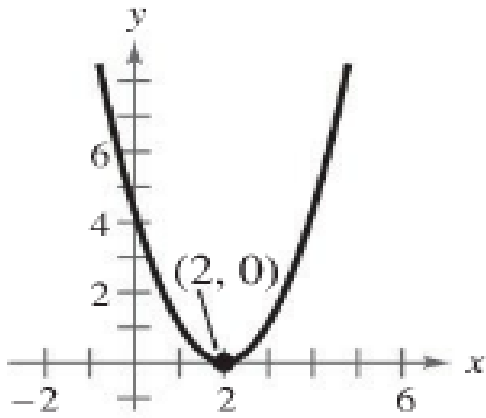
c) $g(x) = x^2 + 3x + \frac{1}{4}$

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

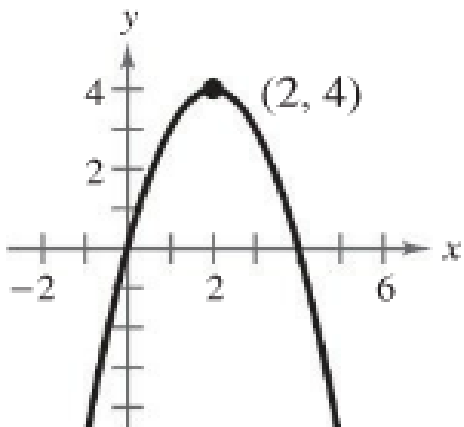
e) $g(x) = 2x^2 - x + 1$

Problem 2. Find the standard form of the quadratic equation.

a)



b)



Problem 3. Write the standard form of the equation of the parabola that has the indicated vertex and whose graph passes through the given point.

a) $V(4, -1), P(2, 3)$

b) $V(-2, -2), P(-1, 0)$

Problem 4. A textile manufacturer has daily production costs of $C = 100,000 - 110x + 0.045x^2$, where C is the total cost (in dollars) and x is the number of units produced. How many units should be produced each day to yield a minimum cost? What is the minimum cost?

Problem 5. The profit P (in hundreds of dollars) that a company makes depends on the amount x (in hundreds of dollars) the company spends on advertising according to the model $P = 230 + 20x - 0.5x^2$. What expenditure for advertising will yield a maximum profit?

Homework: Read section 2.1, do #15, 21, 25, 39, 43, 49, 65, 77, 79 (the quiz for this section will be similar to these problems)