

(6)

Notes on ICNS 100

Chapter 3: 3.3 Quadratic Functions

1. A function f is a quadratic function if and only if $f(x)$ can be written in the form $f(x) = ax^2 + bx + c$, where a, b , and c are constants and $a \neq 0$.
2. The graph of the quadratic function $y = f(x) = ax^2 + bx + c$ is a parabola.
 - (a) If $a > 0$, the parabola opens upward. If $a < 0$, it opens downward.
 - (b) The vertex is $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$.
 - (c) The y -intercept is c .

Example Graph each function. Give the vertex and intercepts, and state the range.

(a) $y = f(x) = x^2 - 6x + 5$

(b) $s = h(t) = 2t^2 + 3t - 2$

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

(d) $t = f(s) = s^2 + 6s + 11$

Example State whether $f(x)$ has a maximum value or a minimum value, and find that value.

(a) $f(x) = -3x^2 - 18x + 7$

(b) $f(x) = x(x + 3) - 12$

Example The demand function for a manufacturer's product is $p = f(q) = 200 - 5q$, where p is the price (in dollars) per unit when q units are demanded (per day). Find the level of production that maximizes the manufacturer's total revenue and determine this revenue.

Example A 6-year-old girl standing on a toy chest throws a doll straight up with an initial velocity of 16 feet per second. The height h of the doll in feet t seconds after it was released is described by the function $h(t) = -16t^2 + 16t + 4$. How long does it take the doll to reach its maximum height? What is the maximum height?

Example Express the area of the rectangle whose length and width are x and $11 - x$ units, respectively. For what value of x will the area be maximum?

Example A building contractor wants to fence in a rectangular plot adjacent to a straight highway using the highway for one side, which will be left unfenced. If the contractor has 500 feet of fence, find the dimensions of the maximum enclosed area.

Example Find two numbers whose sum is 78 and whose product is a maximum.

Assignment: Do Problems 3.3: 14, 16, 20, 30, 32.