Functions and Applications

Chapter 3: Working with Quadratic Functions
Standard and Factored Forms

3.3 Solving Quadratic Equations by Graphing

Functions and Applications

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3.3 Solving Quadratic Equations by Graphing

Learning Goals:

- All quadratic equations can be expressed in the form $ax^2 + bx + c = 0$ using algebraic techniques. They can be solved by graphing the corresponding function $f(x) = ax^2 + bx + c$. The zeros, or x-intercepts, of the function are the solutions, or roots, of the equation.
- A quadratic equation is any equation that contains a polynomial whose highest degree is 2. For example, $x^2 + 8x + 15 = 0$.
- An alternative to solving $ax^2 + bx + c = d$ is to graph both $y = ax^2 + bx + c$ and $y = d$. The solutions will be those points where the two functions intersect.
- You should substitute the solutions into the original equation to verify the result.

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desmos

Please use this opportunity to download the free graphing calculator app "Desmos".

Desmos is a google app, and is available on both the Apple app store, and the Android Google Play Store.

You are welcome to use a graphing calculator during any homework, or in class work. But they are NOT permitted on evaluations.

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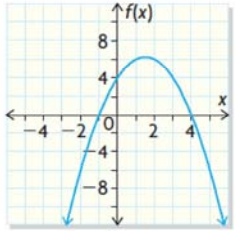
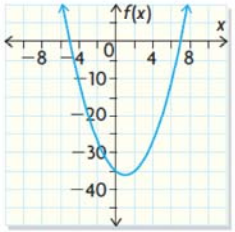
quadratic equation

an equation that contains a polynomial whose highest degree is 2; For example, $x^2 + 7x + 10 = 0$



$y = -x^2 + 3x + 4$



$y = x^2 - 2x - 35$

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root of an equation

a number that when substituted for the unknown, makes the equation a true statement.

For example, x=2 is a root of the equation

$x^2 - x - 2 = 0$ because

$(2)^2 - (2) - 2 = 0$

$4 - 2 - 2 = 0$

The root of an equation is also known as a *solution* to that equation

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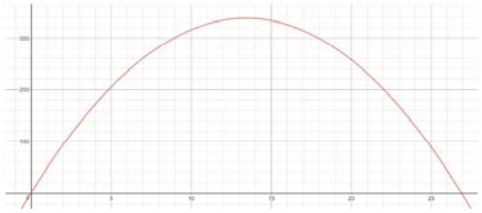
Example:

The function $h(t) = 2 + 50t - 1.862t^2$, where $h(t)$ is the height in metres and t is time in seconds, models the height of a golf ball above the planet Mercury's surface during its flight.

a) What is the maximum height reached by the ball?
b) How long will the ball be above the surface of Mercury?
c) When will it reach a height of 200 m on the way down?



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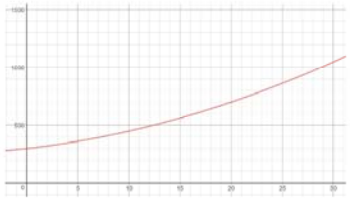
The population of an Ontario city is modelled by the function $P(t) = 0.5t^2 + 10t + 300$, where $P(t)$ is the population in thousands and t is the time in years. *Note*: $t = 0$ corresponds to the year 2000.

a) What was the population in 2000?
b) What will the population be in 2010?
c) When is the population expected to be 1 050 000?



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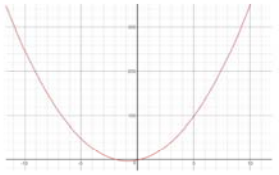
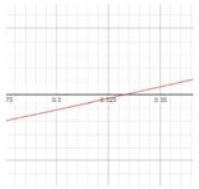
Example:

Graph each function. Then use the graph to solve the quadratic function.

$p(x) = 3x^2 + 5x - 2$ $0 = 3x^2 + 5x - 2$





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Homework:

Page 149 - Questions 1 (use graphing calculator), 2, 3, 5 - 13

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Mid Chapter Review

Homework:

Page 155 - Question 1 - 8