BECA / Dr. Huson / 11.1 IB Math Name: .
Unit 1: Algebra Review

Quadratic functions: solve for the roots or zeros of the function, $f(x) = 0$

For each function, first factor it (always show this step), then state the roots using the form, "$x = 3, 4$" (or whatever the values are).

1. $f(x) = x^2 + 7x + 12$

2. $f(x) = x^2 + 13x + 12$

3. $f(x) = x^2 - 4x - 12$

4. $f(x) = 2x^2 - 10x - 12$

5. $f(x) = -3x^2 + 6x - 3$

6. $f(x) = \frac{1}{2}x^2 + 2x + 2$

BECA / Dr. Huson / 11.1 IB Math Name: .
Unit 1: Algebra Review

Model situations with quadratic functions

7. Expand from vertex form to standard form, $ax^2 + bx + c$ where $a, b, c \quad \epsilon R$
   (a) $f(x) = (x - 2)^2 + 6$
   (b) $f(x) = (x - 5)^2 - 9$
8. Factor each function.
   (a) $f(x) = x^2 + 5x + 6$
   (b) $f(x) = x^2 - 7x + 10$
   (c) $f(x) = x^2 + 6x + 8$
   (d) $f(x) = x^2 - 2x - 8$
   (e) $f(x) = x^2 - 7x - 8$
   (f) $f(x) = x^2 + 3x - 10$

Completing the square

Rewrite the function in vertex form, $f(x) = (x - h)^2 + k$. Include the step showing the $(-\frac{b}{2a})^2$ term.

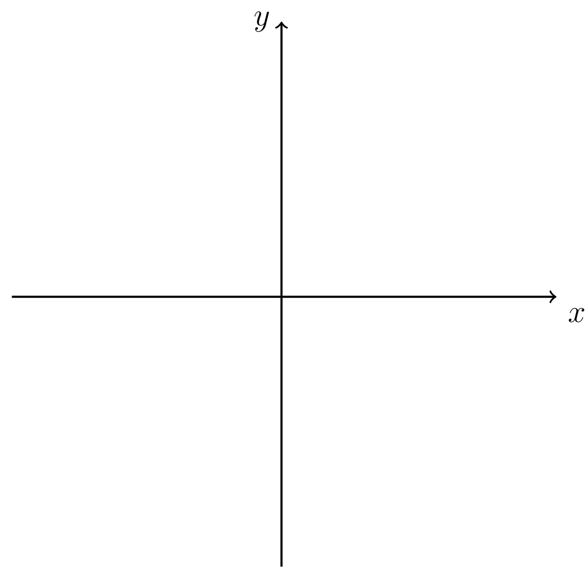
9. $f(x) = x^2 - 6x + 11$

10. $f(x) = x^2 + 8x + 9$

Expand the function from vertex form to standard form, $ax^2 + bx + c$ where $a, b, c \in \mathbb{R}$. Then factor the result and state the roots. Sketch the function, labeling the intercepts with values and the vertex as an ordered pair.

11. $f(x) = (x - 2)^2 - 9$

BECA / Dr. Huson / 11.1 IB Math Name: .
Unit 1: Algebra Review

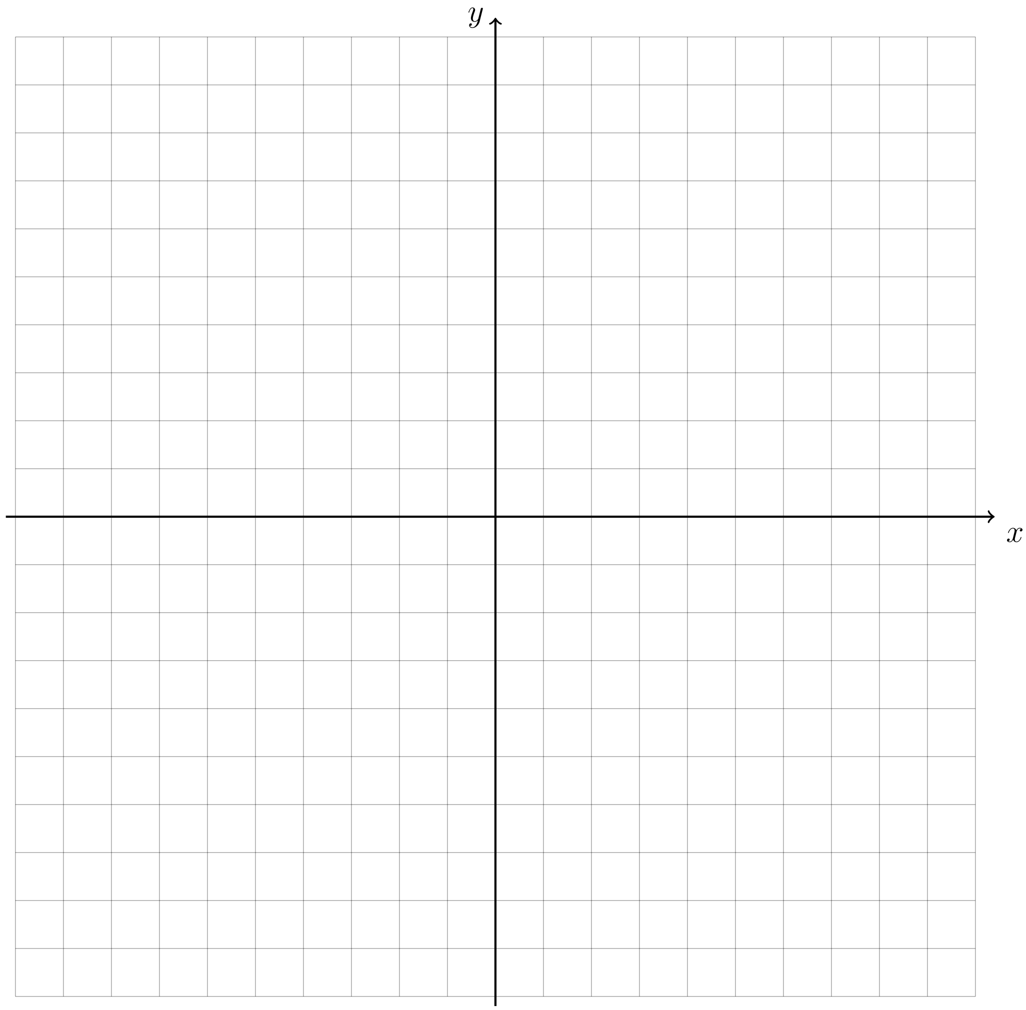


BECA / Dr. Huson / 11.1 IB Math Name: .
Unit 1: Algebra Review

Graphing quadratics

12. Graph the function $f(x) = -x^2 - 4x + 5$. You may use a graphing calculator rather than factoring the function and completing the square.

    Label the scales with at least a few values. Mark the vertex as an ordered pair and label each intercept with its value.



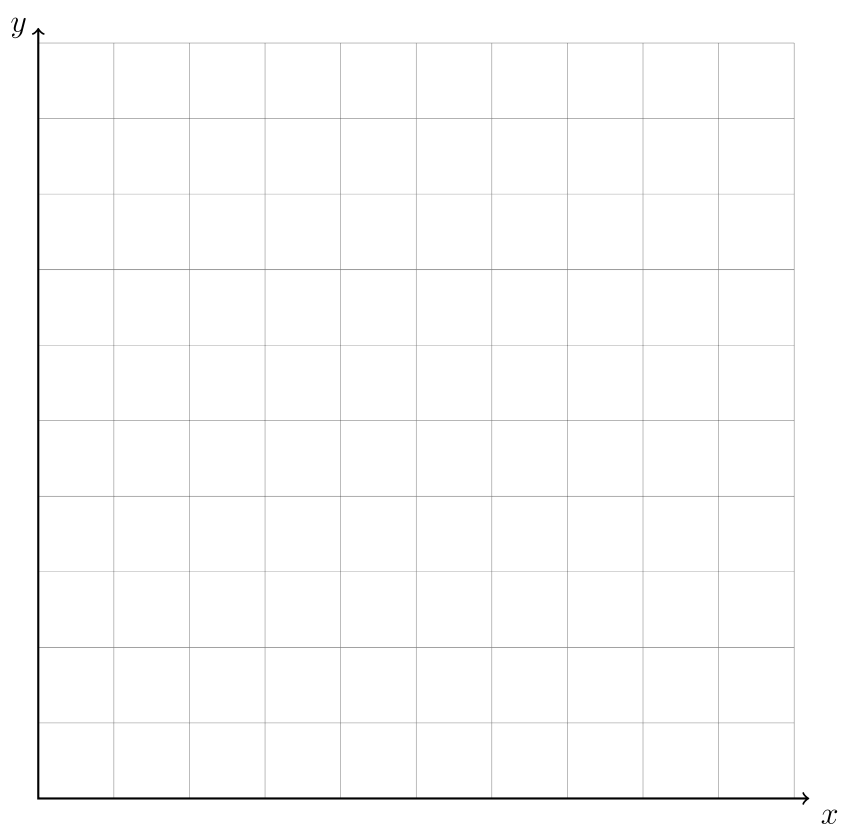
Model situations with quadratic functions

Use a graphing calculator to view the graph and a table of values for the following function:

$$h(x) = -\frac{1}{225}x^2 + \frac{2}{3}x$$

where $h(x)$ represents the height of an object and x it's horizontal position.

Make a table of values to the left of the graph, below. Include key values. Graph the function over domain where $h(x) \geq 0$. Use a horizontal scale of 1 square equals 10 units and vertical scale of 1 square equals 2.5 units. Label the intercepts and vertex.



The inverse of a function

Derive the inverse of each function. Simplify the expression.

13. $f(x) = \frac{1}{2}x + 2$
14. $f(x) = \frac{2}{3}x^2 - 3$
15. $f(x) = \sqrt{x-1} + \frac{1}{2}$

Function substitution

16. Given $f(x) = x^2 - 1$. Simplify $f(2x-1)$?

17. Given $f(x) = x^3$. Simplify $f(x+1)$?

18. Given $f(x) = 4 - (2x^2 + x)$. Simplify $f(\frac{1}{2}x - 3)$?

Function composition

In each exercise, perform the composition $f \circ g$ and simplify.

19. Given $f(x) = \frac{1}{2}x^2 + 1$ and $g(x) = 2x$

20. Given $f(x) = \sqrt{x-4}$ and $g(x) = x^2 + 4$

21. Given $f(x) = \dfrac{1-x}{x^2} + 1$ and $g(x) = 2x + 3$

22. Given $f(x) = 3x + 2$. What is the inverse of the function $f^{-1}(x)$?

    (a) Rewrite the function reversing x and y. (assume that y and $f(x)$ are interchangeable)

    (b) Solve for x. Finish by putting y on the left side of the equality.

    (c) State the answer as $f^{-1}(x)$ equals an expression.

Function substitution

23. Given $f(x) = 3x + 2$. What is $f(2x-1)$?

    (a) Perform the substitution, putting $2x - 1$ in parenthesis.

(b) Simplify, beginning each line with a leading equals sign if it is equal to the line above.

Function composition

24. Given $f(x) = x^2 + 2$ and $g(x) = x^2$ What is $(f \circ g)(x)$?

(a) Rewrite $f \circ g$ and perform the inner substitution (i.e. for g): $f(g(x)) = f(x^2)$

(b) Perform the substitution, putting x^2 in parenthesis (and using a leading equals sign).

(c) Simplify, beginning each line with a leading equals sign.