BECA / Huson / 11.1 IB Math SL Name:
6 October 2017

Functions and Quadratics Review

Materials covered in the next test. Due Tuesday

Solve for the roots or zeros of a quadratic function, $f(x) = 0$

Factoring

Solve for the roots of the function by factoring.

1. $f(x) = x^2 - 4x$
2. $f(x) = -2x^2 + 10x$
3. $f(x) = x^2 - 9x + 18$
4. $f(x) = x^2 - 8x - 20$
5. $f(x) = 2x^2 - 7x - 30$
6. $f(x) = \frac{7}{10}(x^2 + 12x - 45)$

Completing the square

Rewrite the function in vertex form, $f(x) = a(x - h)^2 + k$. Include the step showing the $(-\frac{b}{2a})^2$ term. State the vertex as an ordered pair and the equation for the axis of symmetry.

7. $f(x) = x^2 + 10x + 14$
8. $f(x) = x^2 + 8x + 11$
9. $f(x) = -(x^2 + 2x - 3)$

Using the quadratic formula

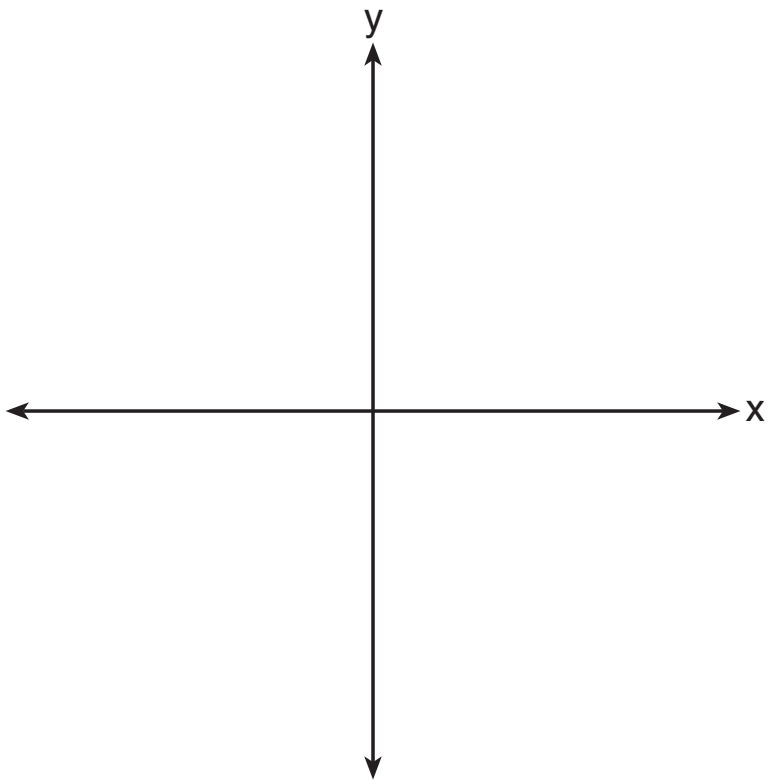
Solve using the quadratic formula.

10. $x^2 + 5x + 5 = 0$
11. $x^2 + 5x = 2$
12. $x^2 + 7x - 7 = 2x^2$

Sketching a quadratic function

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. Show the axis of symmetry as a dotted line and label it with its equation.

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

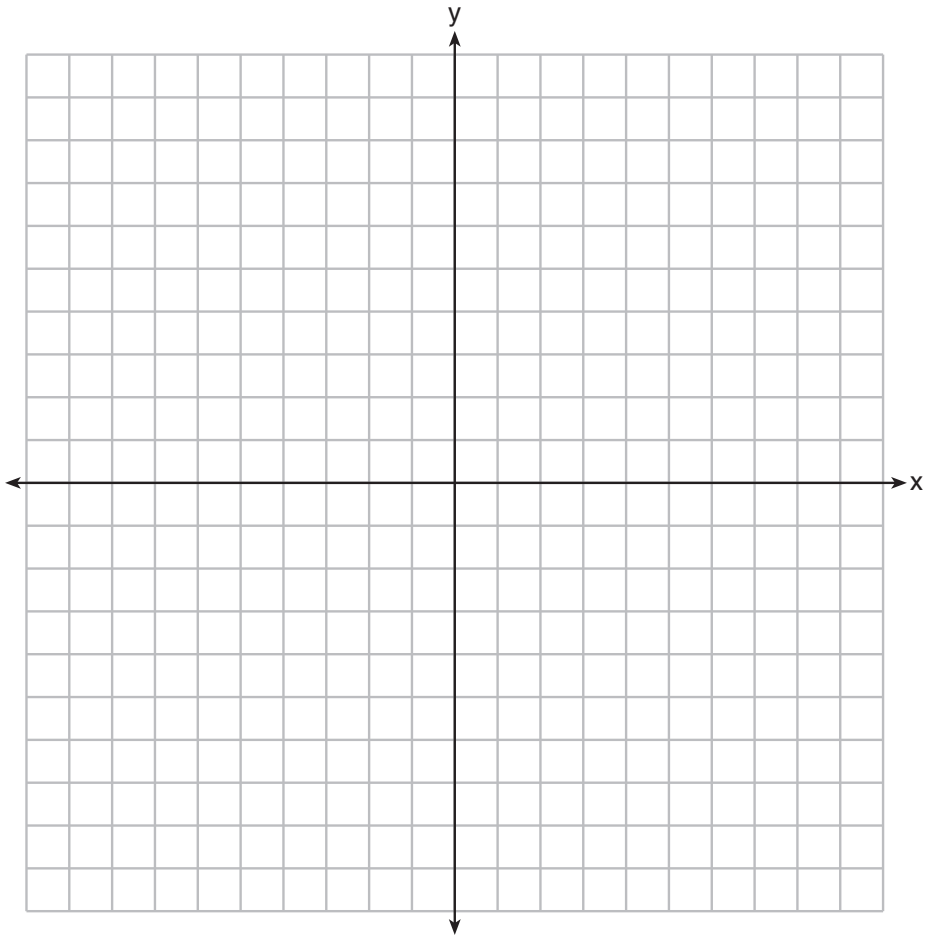


14. $f(x) = \frac{1}{2}(x-4)^2 - 8$
(sketch your own axes for this plot)

Graphing quadratics

15. Graph the function $f(x) = -2x^2 - 4x + 3$. 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. Plot the axis of symmetry as a dotted line and label it with its equation.



Model situations with quadratic functions

The path of a diver is given by

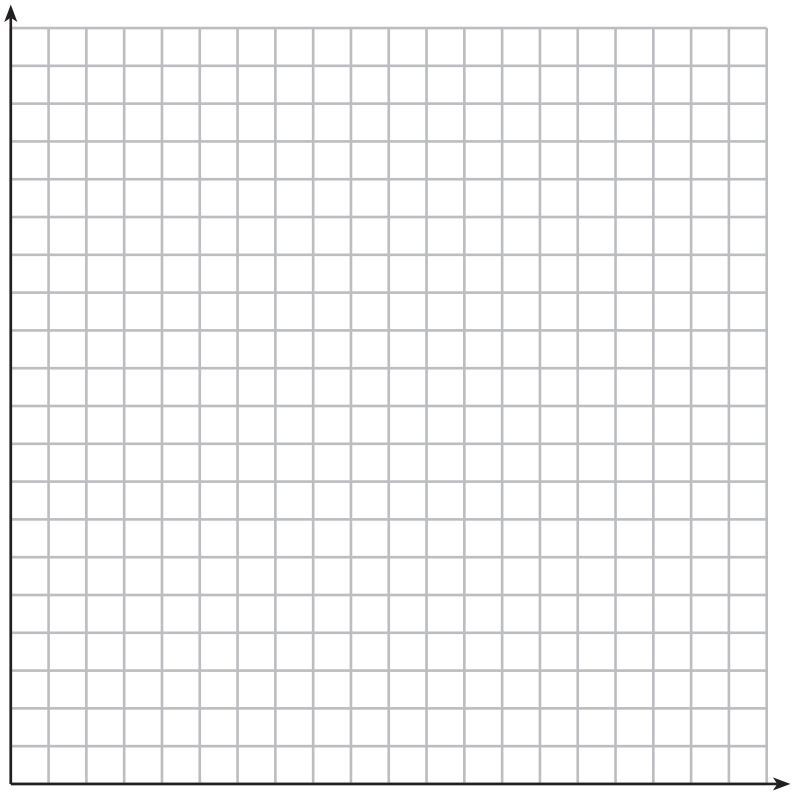
$$y = -\frac{4}{9}x^2 + \frac{24}{9}x + 12$$

where y is the height (in feet) and x is the horizontal distance from the end of the diving board (in feet).

(a) Use a graphing calculator to view the graph and a table of values. On the grid below, graph the function over the domain where $y \geq 0$. Use a horizontal scale of 1 square equals six inches and vertical scale of 1 square equals one foot. Label the intercepts and vertex.

(b) What is the maximum height of the diver?

(c) What is the diver's horizontal distance to the point she enters the water?



The inverse of a function

Derive the inverse of each function. Simplify the expression.

16. $f(x) = \frac{1}{3}x - 12$
17. $f(x) = \frac{2}{3}(x-1)^2 - 5$
18. $f(x) = \sqrt{x-1} - \frac{3}{2}$

Function substitution

19. Given $f(x) = x^2 + x + 1$. Simplify $f(-2x)$?
20. Given $f(x) = x(2x-1)$. Simplify $f(x-11)$?
21. Given $f(x) = 1 - (2x^2 + x)$. Simplify $f(\frac{3}{4}x - 3)$?

Function composition

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

22. Given $f(x) = \frac{1}{2}x^2 + 1$ and $g(x) = \sqrt{x}$
23. Given $f(x) = \dfrac{1}{x-4}$ and $g(x) = \dfrac{1}{x} + 4$
24. Given $f(x) = \dfrac{1-x}{x^2} + 1$ and $g(x) = 3x - 3$

Domain and range of a function

State the domain and range of each function

25. $f(x) = (x-3)^2 - 14$
26. $g(x) = \sqrt{x+2} + 3$
27. The function graphed below.