Name _____

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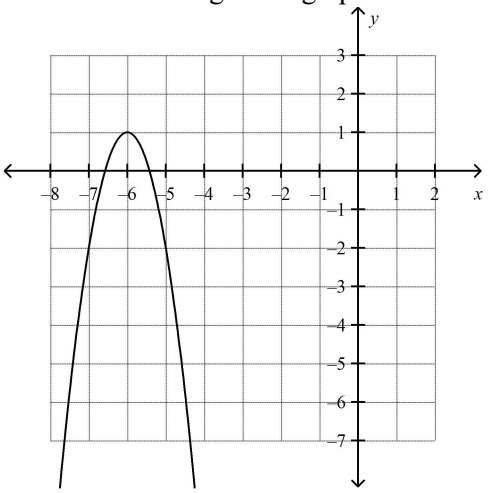
MATH@TD
*MCR3U*

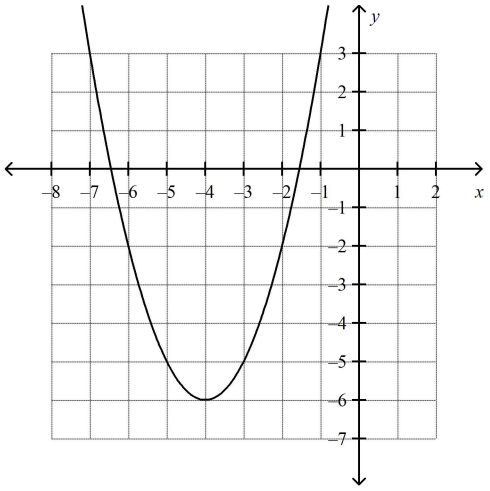
## 3U: U3 - Lessons 1 - 3 Review

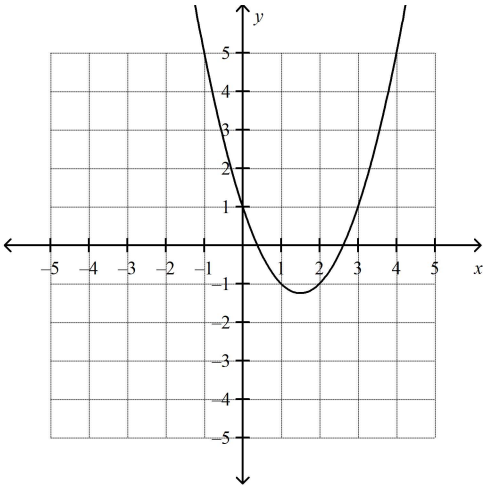
**Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

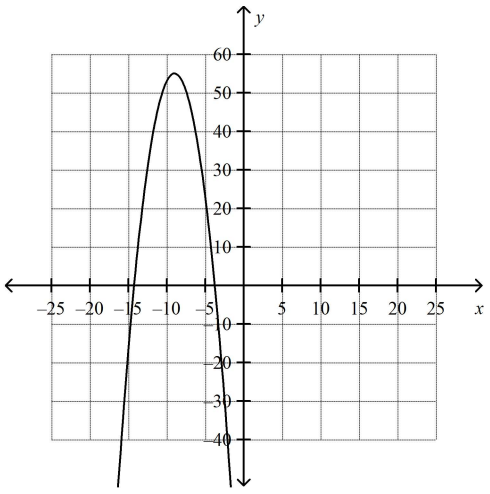
____ 1. Which of the following is true about the parabola for the function $f(x) = 3(x - 4)^2 + 5$?
a. The $y$-intercept is 0.
b. The vertex is (4, 5).
c. The axis of symmetry is $x = -4$.
d. The parabola opens down.

____ 2. Which of the following is the graph for the function $f(x) = -3(x + 6)^2 + 1$?

a.


c.


b.


d.


____ 3. The Canada Calendar Company reduces the prices of its calendars each January. The function $f(x) = -25(x - 9)^2 + 200$ models the company's profits, where $x$ is the price of a calendar in dollars. At what calendar price will the company receive maximum profits?
a. $5
b. $9
c. $10
d. $15

____ 4. The points (–1, –11) and (5, –11) are the same distance from the vertex of their parabola. What is the equation for the axis of symmetry of the parabola?

a. $x = -1$
c. $x = -11$
b. $x = 2$
d. $x = 5$

____ 5. Which of the following quadratic functions will have a minimum value?

a. $h(x) = -3(x + 4)^2 + 8$
c. $f(x) = 2x^2 + 9x - 13$
b. $g(x) = -5x^2 + 3x + 7$
d. $y = -(x - 6)^2 - 15$

____ 6. What is the minimum value for the function $f(x) = 4x^2 - 8x + 16$?

a. –12
c. 12
b. 1
d. 16

____ 7. Which of the following expresses $\sqrt{96}$ in simplest form?

a. $6\sqrt{3}$
c. $4\sqrt{6}$
b. $16\sqrt{6}$
d. $8\sqrt{2}$

____ 8. Which of the following expresses $\sqrt{8} \times \sqrt{32}$ in simplest form?

a. $2\sqrt{64}$
c. $8\sqrt{2}$
b. 16
d. $4\sqrt{8}$

____ 9. Which of the following expresses $16\sqrt{10} + 2\sqrt{10}$ in simplest form?

a. 180
c. $36\sqrt{5}$
b. $18\sqrt{10}$
d. 320

____ 10. Which of the following expresses $\left(4 - \sqrt{7}\right)\left(5 + \sqrt{60}\right)$ in simplest form?

a. $20 + 40\sqrt{6} - 5\sqrt{7} - 10\sqrt{42}$
c. $-21\sqrt{97}$
b. $20 - 2\sqrt{105}$
d. $20 + 8\sqrt{15} - 5\sqrt{7} - 2\sqrt{105}$

____ 11. Which of the following expresses $8\sqrt{200}$ in simplest form?

a. $80\sqrt{2}$
c. 160
b. $40\sqrt{5}$
d. $18\sqrt{2}$

____ 12. Which of the following expresses $3\sqrt{7} - 2\sqrt{28}$ in simplest form?

a. –1
c. $-\sqrt{21}$
b. $-5\sqrt{7}$
d. $-\sqrt{7}$

Provide clear solutions to the following problems:

13. A quadratic function has these characteristics:
$x = 1$ is the equation for the axis of symmetry.
$x = -1$ is an $x$-intercept.
$y = -4$ is the minimum value.
Determine the $y$-intercept of this parabola. Hint - you need the equation of the quadratic function. Which form (standard, vertex or zeros/factored form) should you use, and why?

14. Does the parabola for the function $f(x) = -(x-7)^2 + 10$ open up or down? What is the range? Explain your answer by drawing a rough sketch may be helpful (plot the vertex and direction of opening - no need for the zeros, y-intercept and its symmetric partner - just a rough sketch)

15. An ice cream company varies the prices of its pint containers to maximize profit. The function $P(x) = -80(x-3)^2 + 150$ models the company's profits in thousands of dollars, where $x$ is the price of a pint of ice cream in dollars. At what price will the company receive **maximum** profits? How much profit will the company earn? (when you see the word maximum (or minimum), bells should go off in your head and you should hear a voice which says "Find the Vertex" - you have many options, and in this case finding the vertex is ridiculously easy).

16. The cost, $c(x)$, in dollars per hour of running a certain fishing boat is modelled by the function $c(x) = 0.9x^2 - 18.1x + 135.1$, where $x$ is the speed in kilometres per hour. At what approximate speed should the boat travel to achieve **minimum** cost? (use your favorite method for finding the vertex - personally I like finding the AoS by using $AoS = \frac{-b}{2a}$)

17. The cost function for a clock factory is $C(x) = 7x + 27$ and the revenue function is $R(x) = -4x^2 + 39x$, where $x$ is the number of clocks sold, in thousands. Determine the profit function for the number of clocks sold. Then determine the number of clocks sold that maximizes profit.

18. Simplify.
$-4\sqrt{51} \times 6\sqrt{3}$

19. Simplify.
$3\sqrt{12} + \sqrt{24} - 2\sqrt{36}$

20. Simplify $\left(7 + \sqrt{50}\right)\left(-9 - \sqrt{32}\right)$.

21. Simplify.
$3\sqrt{2}\left(6\sqrt{6} - \sqrt{10}\right) - 12\sqrt{3}$

22. Simplify $\left(8 - 3\sqrt{6}\right)\left(2\sqrt{14} - 5\right)$.