Algebra 1: Quadratic Functions Review (Ch. 9 part 1)

1. Find the rule of a parabola that has the x-intercepts at \((-6,0)\) and \(\left(\frac{1}{3},0\right)\).

2. Find the rule of a parabola that has the x-intercepts at \((4,0)\) and \((5,0)\).

3. What two lines make up the parabola \(y = x^2 + 10x + 16\).

4. What two lines make up the parabola \(y = 3x^2 + 2x - 1\).

9.1.1: I can identify the anatomy (vertex, axis of symmetry, min/max) of a parabola and state domain and range.

For each of the following quadratic functions state: whether it is a min or a max, the vertex, the axis of symmetry, domain and the range.

5. \(y = -8x^2 - 3\)

6. \(y = \frac{1}{5}x^2 + 4\)

7. \(y = -\frac{1}{2}x^2 - 5\)

8. \(y = 10x^2 + 41\)

9.1.2: I can graph quadratic functions of the form \(y = ax^2\) and \(y = ax^2 + c\)

11. Graph \(y = x^2 - 5\).
12. Graph \( y = -2x^2 + 4 \).

13. Put questions 7-12 in order from widest to skinnest.

S.Q.1: I can graph, state domain and range, and identify the anatomy of quadratic functions of the form \( y = a(x - h)^2 + k \) and state domain and range.

14. How is the graph of \( y = 4x^2 + 1 \) different from the graph of \( y = 4x^2 \)?
   a. It is shifted 1 unit(s) up.
   b. It is shifted 1 unit(s) down.
   c. It is shifted 1 unit(s) left.
   d. It is shifted 1 unit(s) right.

15. How is the graph of \( y = -2x^2 - 5 \) different from the graph of \( y = -2x^2 \)?
   a. It is shifted 5 unit(s) up.
   b. It is shifted 5 unit(s) down.
   c. It is shifted 5 unit(s) left.
   d. It is shifted 5 unit(s) right.

16. Identify the vertex, axis of symmetry, domain, range of the graph of the function. Also state whether the function is a min or max, wide/normal, skinny. \( y = 2(x + 2)^2 - 4 \).

17. Identify the vertex, axis of symmetry, domain, range of the graph of the function. Also state whether the function is a min or max, wide/normal, skinny. \( y = (x - 3)^2 - 4 \).

18. Identify the vertex, axis of symmetry, domain, range of the graph of the function. Also state whether the function is a min or max, wide/normal, skinny. \( y = -3(x + 2)^2 + 2 \).

19. Graph the following function: \( y = 2(x - 4)^2 + 1 \)

20. Graph the following function: \( y = -\frac{1}{2}(x + 3)^2 + 6 \)
9.2.1: I can graph, state domain and range, and identify the anatomy of quadratic functions of the form $y = ax^2 + bx + c$.

21. State whether the following function is a min/max, wide/normal/skinny, find the vertex, find the axis of symmetry, find domain, and find range. $f(x) = x^2 + 2x + 2$

22. State whether the following function is a min/max, wide/normal/skinny, find the vertex, find the axis of symmetry, find domain, and find range. $f(x) = -4x^2 + 4x + 1$

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

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

25. A ball is thrown into the air with an upward velocity of 28 ft/s. Its height $h$ in feet after $t$ seconds is given by the function $h = -16t^2 + 28t + 7$. How long does it take the ball to reach its maximum height? What is the ball’s maximum height? Round to the nearest hundredth, if necessary.

26. A catapult launches a boulder with an upward velocity of 148 ft/s. The height of the boulder, $h$, in feet after $t$ seconds is given by the function $h = -16t^2 + 148t + 30$. How long does it take the boulder to reach its maximum height? What is the boulder’s maximum height? Round to the nearest hundredth, if necessary.

S.Q.2: I can model quadratic functions.

What is the equation, in standard form, of a parabola that models the values in the table?

27. | $x$ | $-2$ | $0$ | $4$ |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>$2$</td>
<td>$-2$</td>
<td>$86$</td>
</tr>
</tbody>
</table>

28. | $x$ | $-2$ | $0$ | $4$ |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>$-7$</td>
<td>$3$</td>
<td>$-73$</td>
</tr>
</tbody>
</table>
29. A biologist took a count of the number of migrating waterfowl at a particular lake, and recounted the lake’s population of waterfowl on each of the next six weeks.

<table>
<thead>
<tr>
<th>Week</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>585</td>
<td>582</td>
<td>629</td>
<td>726</td>
<td>873</td>
<td>1,070</td>
<td>1,317</td>
</tr>
</tbody>
</table>

Find a quadratic function that models the data as a function of \( x \), the number of weeks. Use the model to estimate the number of waterfowl at the lake on week 8.

a. \( P(x) = 25x^2 - 28x + 585; 1,614 \) waterfowl  
   c. \( P(x) = 25x^2 - 28x + 585; 1,961 \) waterfowl  

b. \( P(x) = 30x^2 + 28x + 535; 2,679 \) waterfowl  
   d. \( P(x) = 30x^2 + 28x + 535; 2,201 \) waterfowl

30. A biologist took a count of the number of fish in a particular lake, and recounted the lake’s population of fish on each of the next six weeks.

<table>
<thead>
<tr>
<th>Week</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>495</td>
<td>483</td>
<td>481</td>
<td>489</td>
<td>507</td>
<td>535</td>
<td>573</td>
</tr>
</tbody>
</table>

Find a quadratic function that models the data as a function of \( x \), the number of weeks. Use the model to estimate the number of fish at the lake on week 11.

a. \( P(x) = 5x^2 - 17x + 495; 1,842 \) fish  
   c. \( P(x) = 10x^2 + 17x + 445; 1,842 \) fish  

b. \( P(x) = 5x^2 - 17x + 495; 621 \) fish  
   d. \( P(x) = 10x^2 + 17x + 445; 1,054 \) fish
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Answer Section

1. \( f \)
2. \( f \)
3. \( f \)
4. \( f \)
5. \((0, 1); \) maximum
6. \((0, -2); \) minimum
7. \( f \)
8. \( f \)
9. \( f \)
10. \( f \)
11. \( f \)
12. \( f \)
13. \( f \)
14. \( A \)
15. \( B \)
16. vertex: \((-2, -4);\) 
axis of symmetry: \(x = -2\)
17. minimum value: \(-4\)
domain: all real numbers
range: all real numbers \(\geq -4\)
18. vertex: \((-2, 2);\) 
axis of symmetry: \(x = -2\)
19. \( f \)
20. \( f \)
21. 
axis of symmetry: \(x = -1\)
vertex: \((-1, 1)\)
22. Axis of symmetry: $x = 0.5$
Vertex: $(0.5, 2)$

23. Axis of symmetry: $x = -2$
Vertex: $(-2, -3)$
axis of symmetry: $x = 0.5$
vertex: $(0.5, -0.5)$

25. 0.88 s; 19.25 ft
26. 4.63 s; 372.25 ft
27. $y = 4x^2 + 6x - 2$
28. $y = -4x^2 - 3x + 3$
29. C
30. A