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Show that each function is a quadratic function by writing it in standard form. Identify $\mathbf{a}, \mathbf{b}$ \& $\mathbf{c}$.

1. $f(x)=(x-3)(x-5)$
2. $g(x)=(7-x)(9-x)$
3. $k(x)=-3(x-11)(x+1)$
4. $h(x)=(2 x+5)(3 x-1)$
5. $d(x)=(x-3)^{2}-4$

State whether each function is quadratic. Use a graph to verify. Provide an explanation about why each IS/IS NOT quadratic based on the equation and based on the graph.
6. $f(x)=-4 x+x^{2}$
7. $k(x)=\frac{1}{x}$
8. $h(x)=\frac{2 x^{3}+x}{x^{2}-1}$
9. $g(x)=16-3 x$
10. $\quad b(x)=x^{2}-2 x(x+1)$
11. $m(x)=3 x-x(x+9)$

WITHOUT A CALCULATOR, state whether the parabora opens up or down and whether the $y$ coordinate of the vertex is the minimum value or the maximum value of the function. Then use your calculator to find the max/ min value.
12. $f(x)=5 x^{2}-3 x$
13. $g(x)=4 x^{2}+7 x-2$
14. $h(x)=(5-x)(2-3 x)$
15. $q(x)=(4-x)(2+7 x)$

Graph each function and give the approximate coordinates of the vertex.
16. $k(x)=4 x^{2}-3$

17. $h(x)=-x^{2}-x+6$
18. $p(x)=-(x+4)(x-0.5)$



Tell whether each statement is true or false.
19. The graph of a quadratic function is always a parabola.
20. The graphs of all quadratic functions open upward.
21. The graph of $f(x)=x^{2}$ has a maximum value at $(0,0)$.

Identify the axis of symmetry of the graph of each function. Write the coordinates of the vertex.
22. $f(x)=-3(x+1)^{2}-7$
23. $g(x)=x^{2}-4 x+2$
24. $h(x)=-8 x^{2}+12 x-11$
25. $k(x)=-4(x+3)^{2}+9$

For each function, (a) determine whether the graph opens upward or downward, (b) find the axis of symmetry, (c) find the vertex, and (d) find the $y$-intercept. Then graph the function.
26. $f(x)=-x^{2}+3 x+1$
a. Upward or downward
b. Axis of symmetry
c. Vertex
d. $y$-intercept

27. $g(x)=2 x^{2}+4 x-2$
$\qquad$ a. Upward or downward
b. Axis of symmetry
$\qquad$ c. Vertex
$\underline{ }$
d. $y$-intercept


## Find the minimum or maximum value of each function WITHOUT a calculator.

28. $g(x)=x^{2}-2 x+1$
29. $h(x)=-5 x^{2}+15 x-3$

## Solve.

30. Write the vertex form of a quadratic function that opens upward and a $y$-intercept of 3 .
31. The vertex of the function $g(x)=4 x^{2}+b x+16$ is at $(2,0)$. Find the value of $b$ for the function.
32. The $y$-intercept of function $g(x)=2(x-3)^{2}+k$ is -2 . Find the value of $k$.
33. An airline sells a 3-day vacation package. Sales from this vacation package can be modeled by the quadratic function $s(p)=-40 p 2+32000 p$. Sales are dependent on the price, $p$, of the package. If the price is set too high, the package won't sell, but if the price is too low, prospective buyers will think it is a scam.
A. At what price, $p$, does the company have the greatest revenue?
B. What are the maximum sales possible based on this model?
c. What is the revenue from the vacation package if the price is set at $\$ 800$ ?
34. A record label uses the following function to model the sales of a new release: $a(t)=-90 t^{2}+8100 t$ The number of albums sold is a function of time, $t$, in days.
A. On which day were the most albums sold?
B. What is the maximum number of albums sold on that day?
