Properties of Quadratic Functions Review

January-07-19
9:29 AM

PRE-CALCULUS 11
QUADRATIC FUNCTIONS
PROPERTIES OF QUADRATIC FUNCTIONS REVIEW

A. Definitions

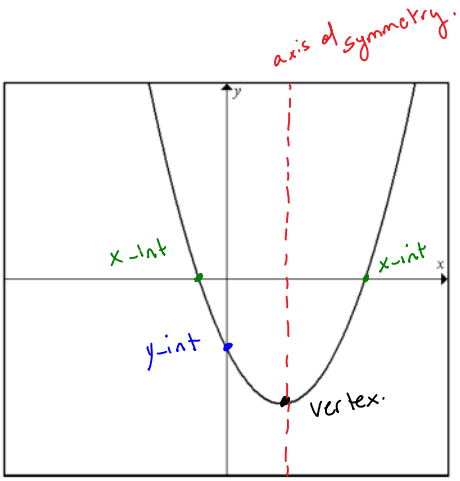
1. **quadratic function:** any function that can be written in the form: $y = ax^2 + bx + c$ or $f(x) = ax^2 + bx + c$. Where a, b and c are constants and $a \neq 0$.
2. **x-intercept:** the place where the curve crosses the x-axis. These are also referred to as the roots or zeros of the function.
3. **y-intercept:** the place where the curve crosses the y-axis. In the form of the quadratic function the c value represents the y-intercept.
4. **vertex:** the highest or lowest point of a quadratic function.
5. **axis of symmetry:** the imaginary line, through the vertex, that divides the quadratic function into two perfect halves.
6. **maximum/minimum:** the highest or lowest point of a quadratic function.

B. Properties of a Quadratic Function

Remember the important properties of a quadratic function.

The axis of symmetry is always represented by an equation

$X = ?$



C. Maximum/Minimum Points

Remember that the vertex of a quadratic function will represent the highest/lowest point of the parabola. Whether the graph will have a maximum or a minimum point is determined by the sign of the "a" value in the function.

Positive "a" Value

Upright Parabola
Minimum Graph

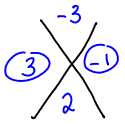
Negative "a" Value

Inverted Parabola
Maximum Graph

D. Examples

For each of the following quadratic functions, determine the x-intercepts (zeros), y-intercept, vertex, the equation of the axis of symmetry, and whether the graph is a maximum or minimum.

1) $y = x^2 + 2x - 3$



$0 = x^2 + 2x - 3$

$0 = (x + 3)(x - 1)$

$0 = x + 3$ (−3) $\quad 0 = x - 1$ (+1)

x-int $(-3, 0)$ & $(1, 0)$

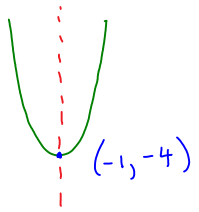
x-coord $= \frac{-3+1}{2} = -1$

$y = (-1)^2 + 2(-1) - 3$

y-coord $= -4$

Vertex $(-1, -4)$

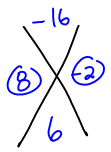
y-int $(0, -3)$



Axis of Sym $x = -1$

Minimum

2) $y = -2x^2 - 12x + 32$



$0 = -2x^2 - 12x + 32$

$0 = -2(x^2 + 6x - 16)$

$0 = -2(x + 8)(x - 2)$

$0 = x + 8$ $\quad 0 = x - 2$

$-8 \quad -8 \quad +2 \quad +2$

x-int $(-8, 0)$ & $(2, 0)$

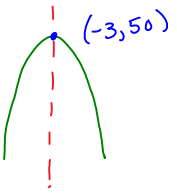
x-coord $= \frac{-8 + 2}{2} = -3$

$y = -2(-3)^2 - 12(-3) + 32$.

y-coord $= 50$

Vertex $(-3, 50)$

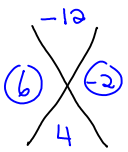
y-int $(0, 32)$



Axis of Sym $x = -3$

Maximum

3) $y = \frac{1}{2}x^2 + 2x - 6$



$0 = \frac{1}{2}x^2 + 2x - 6$

$0 = \frac{1}{2}(x^2 + 4x - 12)$

$0 = \frac{1}{2}(x + 6)(x - 2)$

$0 = x + 6$ $\quad 0 = x - 2$

$-6 \quad -6 \quad +2 \quad +2$

x-int $(-6, 0)$ & $(2, 0)$.

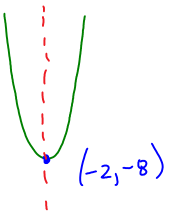
x-coord $= \frac{-6 + 2}{2} = -2$

$y = \frac{1}{2}(-2)^2 + 2(-2) - 6$

y-coord $= -8$

Vertex $(-2, -8)$.

y-int $(0, -6)$



Axis of Sym $x = -2$

Minimum

Assignment : Properties of Quadratic Functions Review Assignment #1 – 12

PRE-CALCULUS 11
QUADRATIC FUNCTIONS
PROPERTIES OF QUADRATIC FUNCTIONS REVIEW ASSIGNMENT

A. For each of the following quadratic functions, determine the coordinates of the x-intercepts, y-intercept and vertex, then graph the function and state the domain and range.

1) $y = x^2 + 6x + 8$

2) $y = 2x^2 - 8$

3) $y = -x^2 + 4x - 3$

4) $y = -x^2 + 2x - 3$

B. For each of the following quadratic functions, determine, the vertex, the equation for the axis of symmetry whether the graph is a maximum or minimum.

5) $y = x^2 - 8x + 12$

6) $y = x^2 + 6x - 7$

7) $y = -2x^2 + 2x + 24$

8) $y = -x^2 - x + 6$

9) $y = \frac{1}{2}x^2 + 2x - \frac{5}{2}$

10) $y = 3x^2 - 9x - 30$

11) $y = x^2 + 3x - 4$

12) $y = \frac{1}{3}x^2 - \frac{5}{3}x + \frac{4}{3}$

Answers

1) x-int $(-2,0)$, $(-4,0)$
y-int $(0,8)$
vertex $(-3,-1)$
Domain $x \in R$
Range $y \geq -1$

2) x-int $(-2,0)$, $(2,0)$
y-int $(0,-8)$
vertex $(0,-8)$
Domain $x \in R$
Range $y \geq -8$

3) x-int $(1,0)$, $(3,0)$
y-int $(0,-3)$
vertex $(2,-1)$
Domain $x \in R$
Range $y \geq -1$

4) x-int $(-1,0)$, $(3,0)$
y-int $(0,3)$
vertex $(1,4)$
Domain $x \in R$
Range $y \leq 4$

5) vertex $(4,-4)$
axis of sym $x = 4$
Minimum

6) vertex $(-3,-16)$
axis of sym $x = -3$
Minimum

7) vertex $(0.5,24.5)$
axis of sym $x = 0.5$
Maximum

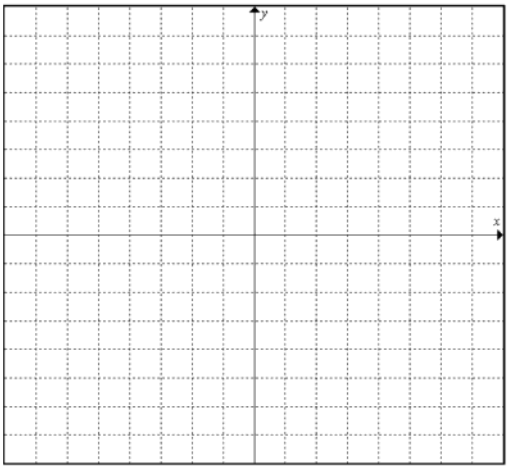
8) vertex $(-0.5,6.25)$
axis of sym $x = -0.5$
Maximum

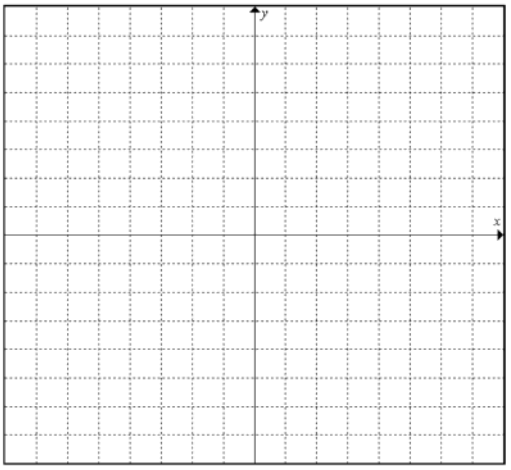
9) vertex $(-2,-4.5)$
axis of sym $x = -2$
Minimum

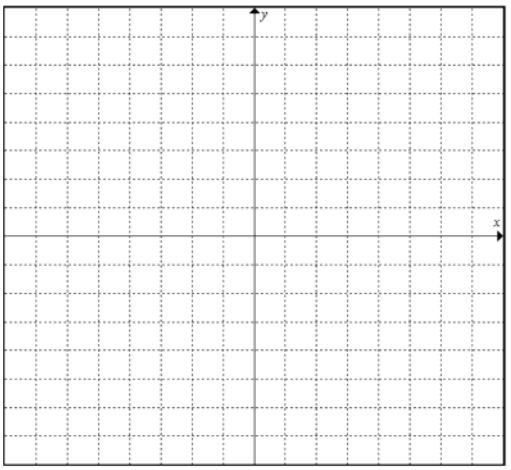
10) vertex $(1.5,-36.75)$
axis of sym $x = 1.5$
Minimum

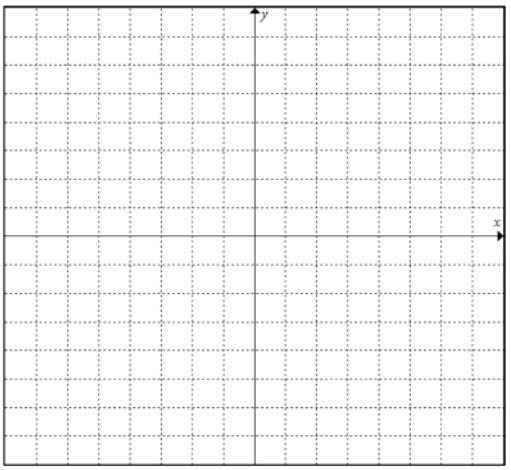
11) vertex $(-1.5,-6.25)$
axis of sym $x = -1.5$
Minimum

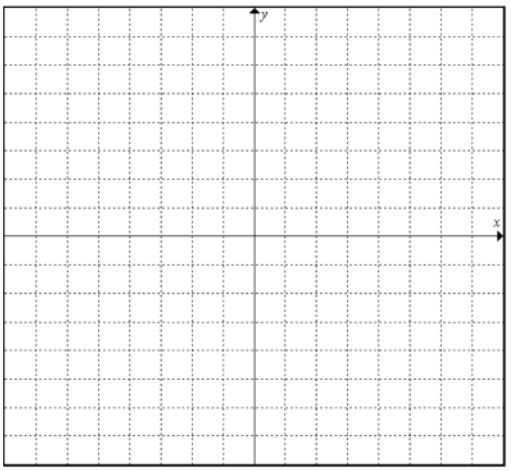
12) vertex $(2.5,-0.75)$
axis of sym $x = 2.5$
Minimum

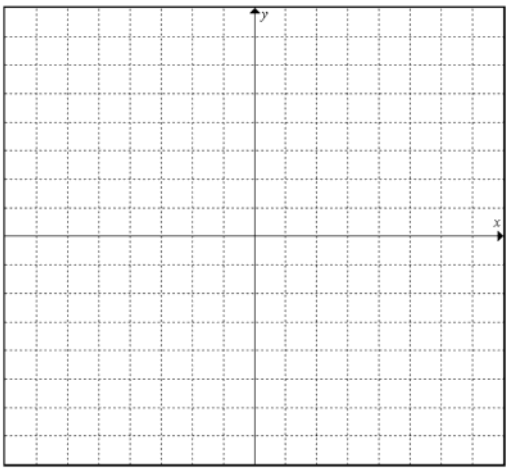

y
x


y
x


y
x


y
x


y
x


y
x