

The Quadratic Relation

Homework Handout

Graph each of the quadratic relations below. Then determine the properties listed below for each parabola.

Properties:

- | | |
|-------------------------------------|-----------------------------|
| a) direction of opening | b) vertex |
| c) over-1 points | d) over-2 points |
| e) maximum or minimum point | f) maximum or minimum value |
| g) equation of the axis of symmetry | h) domain |
| i) range | |

Part A – The Properties of $y = ax^2$, $a \in \mathbb{R}, a \neq 0$

- | | | | |
|-------------------------|-------------------------|--------------------------|--------------------------|
| a) $y = x^2$ | b) $y = 4x^2$ | c) $y = 6x^2$ | d) $y = -3x^2$ |
| e) $y = \frac{3}{2}x^2$ | f) $y = \frac{1}{4}x^2$ | g) $y = -\frac{1}{3}x^2$ | h) $y = -\frac{3}{4}x^2$ |

Part B – The Properties of $y = ax^2 + k$, $a, k \in \mathbb{R}, a \neq 0$

- | | | |
|-------------------|------------------------------|------------------------------|
| a) $y = x^2$ | b) $y = x^2 + 7$ | c) $y = x^2 - 4$ |
| d) $y = 3x^2 + 2$ | e) $y = \frac{1}{2}x^2 - 6$ | f) $y = \frac{-1}{3}x^2 + 5$ |
| g) $y = 5x^2$ | h) $y = x^2 + 4$ | i) $y = 4x^2 - 2$ |
| j) $y = -x^2 + 2$ | k) $y = \frac{-1}{2}x^2 + 9$ | l) $y = 2(1-2x^2)$ |

Part C – The Properties of $y = a(x-h)^2$, $a, h \in \mathbb{R}, a \neq 0$

- | | | |
|--------------------|------------------------------|-------------------|
| a) $y = (x+5)^2$ | b) $y = (x-4)^2$ | c) $y = 2(x+1)^2$ |
| d) $y = -3(x-5)^2$ | e) $y = \frac{1}{2}(x-2)^2$ | f) $y = -(x+3)^2$ |
| g) $y = 3(x-6)^2$ | h) $y = \frac{-1}{3}(x-1)^2$ | |

Part D – The Properties of $y = a(x-h)^2 + k$, $a, h, k \in \mathbb{R}, a \neq 0$

- | | | | |
|-----------------------|------------------------------|-----------------------|---------------------------------|
| a) $y = (x+3)^2 - 2$ | b) $y = 2(x-1)^2 - 5$ | c) $y = -(x+1)^2 + 4$ | d) $y = (x-6)^2 - 5$ |
| e) $y = 3(x-5)^2 - 8$ | f) $y = -\frac{1}{2}x^2 + 3$ | g) $y = -2(x+3)^2$ | h) $y = \frac{1}{3}(x+5)^2 + 2$ |