

DAY 5 – Vertex Form of Quadratic Relations: $y = a(x - h)^2 + k$

1. For each of the following quadratic relations in vertex form, (i) state the transformations, (ii) graph the parabola, and (iii) state the key features.

	$y = -2(x - 4)^2 + 5$	$y = \frac{1}{3}(x + 2)^2 - 4$																																																																								
(i) TRANSFORMATIONS	$a = -2, h = 4, k = 5$ <table><tr><th>x</th><th>y</th><th>x</th><th>$-2y$</th><th>$x+4$</th><th>$y+5$</th></tr><tr><td>-2</td><td>4</td><td>-2</td><td>-8</td><td>2</td><td>-3</td></tr><tr><td>-1</td><td>1</td><td>-1</td><td>-2</td><td>3</td><td>3</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>4</td><td>5</td></tr><tr><td>1</td><td>1</td><td>1</td><td>-2</td><td>5</td><td>3</td></tr><tr><td>2</td><td>4</td><td>2</td><td>-8</td><td>6</td><td>-3</td></tr></table>	x	y	x	$-2y$	$x+4$	$y+5$	-2	4	-2	-8	2	-3	-1	1	-1	-2	3	3	0	0	0	0	4	5	1	1	1	-2	5	3	2	4	2	-8	6	-3	$a = \frac{1}{3}, h = -2, k = -4$ <table><tr><th>x</th><th>y</th><th>x</th><th>$\frac{1}{3}y$</th><th>$x-2$</th><th>$y-4$</th></tr><tr><td>-2</td><td>4</td><td>-2</td><td>1.3</td><td>-4</td><td>-2.7</td></tr><tr><td>-1</td><td>1</td><td>-1</td><td>0.3</td><td>-3</td><td>-3.7</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>-2</td><td>-4</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0.3</td><td>-1</td><td>-3.7</td></tr><tr><td>2</td><td>4</td><td>2</td><td>1.3</td><td>0</td><td>-2.7</td></tr></table>	x	y	x	$\frac{1}{3}y$	$x-2$	$y-4$	-2	4	-2	1.3	-4	-2.7	-1	1	-1	0.3	-3	-3.7	0	0	0	0	-2	-4	1	1	1	0.3	-1	-3.7	2	4	2	1.3	0	-2.7
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2. Collect the following information for each quadratic in vertex form. The first one is done.

Equation	Transformations			vertex	axis of symmetry	optimal value
	a	h	k			
$y = -7(x+4)^2 + 10$	• reflection • stretch by 7	• left 4	• up 10	$(-4, 10)$	$x = -4$	$y = 10$, max
$y = 2(x-3)^2 - 5$	stretch by 2	right 3	down 5	$(3, -5)$	$x = 3$	$y = -5$ min
$y = -3(x-5)^2 - 1$	reflection stretch 3	right 5	down 1	$(5, -1)$	$x = 5$	$y = -1$ max
$y = -(x+1)^2 + 6$	reflection stretch 1 (or no stretch)	left 1	up 6	$(-1, 6)$	$x = -1$	$y = 6$ max
$y = \frac{1}{3}(x+5)^2 - 3$	compression by $\frac{1}{3}$	left 5	down 3	$(-5, -3)$	$x = -5$	$y = -3$ min
$y = 0.75(x-3)^2 + 1$	compression by 0.75	right 3	up 1	$(3, 1)$	$x = 3$	$y = 1$ min
$y = -(x+1)^2 - 5$	reflection no stretch	left 1	down 5	$(-1, -5)$	$x = -1$	$y = -5$ max
$y = 4(x-2)^2 - 3$	stretch by 4	right 2	down 3	$(2, -3)$	$x = 2$	$y = -3$ min
$y = -3(x+5)^2 + 2$	reflection stretch by 3	left 5	up 2	$(-5, 2)$	$x = -5$	$y = 2$ max
$y = -2(x-4)^2 + 1$	reflection stretch 2	right 4	up 1	$(4, 1)$	$x = 4$	$y = 1$ max
$y = \frac{1}{2}(x-4)^2 + 3$	compression by $\frac{1}{2}$	right 4	up 3	$(4, 3)$	$x = 4$	$y = 3$ min