ANSWERS => QUADRATIC FUNCTIONS / GRAPHS

1. (a) $f: x \to 3x^2$ and (c) $h: x \to 2x^2 - x + 1$ both define quadratic functions. as the largest exponent in each function is 2. (They have a degree of 2)

2. a) Domain: $\{1 \leq x \leq 7, x \in R\}$

   Range: $\{-4 \leq y \leq 5, y \in R\}$

b) Vertex: $(4, -4)$

c) Axis of Symmetry: $x = 4$.

d) Zeros of the function: $x = 2$, $x = 6$ OR $(2,0)$, $(6,0)$ } SAME

e) x-intercepts: $x = 2$, $x = 6$ OR $(2,0)$, $(6,0)$ } SAME

f) The curve has a minimum point at $(4, -4)$ OR $y = -4$.

g) The curve opens upward.

3a) Domain: $\{x \in R\}$
Range: $\{y \leq 3, y \in R\}$
Vertex: $(0, 3)$
Axis of Symmetry: $x = 0$
Maximum Value: $(0, 3)$ OR $y = 3$

b) Domain: $\{x \in R\}$
Range: $\{y \geq 2.5, y \in R\}$
Vertex: $(0.5, 2.5)$
Axis of Symmetry: $x = 0.5$
Minimum Value: $(0.5, 2.5)$ OR $y = 2.5$

c) Domain: $\{x \in R\}$
Range: $\{y \geq -5, y \in R\}$
Vertex: $(4, -5)$
Axis of Symmetry: $x = 4$
Minimum Value: $(4, -5)$ OR $y = -5$

4a) $y = 3(x-1)^2$
$y = 3(x-1)(x-1)$
$y = (3x-3)(x-1)$
$y = 3x^2 - 3x - 3x + 3$
$y = 3x^2 - 6x + 3$

b) $y = 2(x^2+1)$
$y = 2x^2 + 2$

c) $y = -2(x-3)^2 - \frac{4}{3}$
$y = -2(x-3)(x-3) - \frac{4}{3}$
$y = (-2x+6)(x-3) - \frac{4}{3}$
$y = -2x^2 + 6x + 6x - 18 - \frac{4}{3}$
$y = -2x^2 + 12x - \frac{18}{1} - \frac{4}{3}$
$y = -2x^2 + 12x - \frac{54}{3} - \frac{4}{3}$
$y = -2x^2 + 12x - \frac{58}{3}$

* Remember ORDER OF OPERATIONS

5a) $f(x) = 3x^2 - 2$, $A(-1,-1)$ $B(-1,1)$

$y = 3x^2 - 2$

$A(x, y)$ $A(-1,-1)$

L.S: $y = -1$

R.S: $3x^2 - 2 = 3(-1)^2 - 2 = 3(1) - 2 = 3 - 2 = 1$

L.S ≠ R.S

∴ $A(-1,-1)$ does not satisfy the function.

$B(x, y)$ $B(-1, 1)$

L.S: $y = 1$

R.S: $3x^2 - 2 = 3(-1)^2 - 2 = 3(1) - 2 = 1$

L.S = R.S

∴ $B(-1,1)$ does satisfy the equation.

b) $f(x) = -x^2 + 3$; $A(-2,-1)$ $B(-2,7)$

$y = -x^2 + 3$

$A(-2,-1)$

L.S: $y = -1$

R.S: $-x^2 + 3 = -(-2)^2 + 3 = -4 + 3 = -1$

L.S = R.S

∴ $A(-2,-1)$ does satisfy the equation.

$B(-2,7)$

L.S: $y = 7$

R.S: $-x^2 + 3 = -(-2)^2 + 3 = -4 + 3 = -1$

L.S ≠ R.S

∴ $B(-2,7)$ does not satisfy the equation.

c) $f(x) = x^2 - 2x + 1$; A(-1,2) B(1,0)

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

A(-1,2)

L.S	R.S
y	$x^2 - 2x + 1$
$= 2$	$= (-1)^2 - 2(-1) + 1$
	$= 1 + 2 + 1$
	$= 4$.

L.S ≠ R.S

∴ A(-1,2) does not satisfy the equation.

B(1,0)

L.S	R.S
y	$x^2 - 2x + 1$
$= 0$	$= (1)^2 - 2(1) + 1$
	$= 1 - 2 + 1$
	$= -1 + 1$
	$= 0$

L.S = R.S

∴ B(1,0) does satisfy the equation

d) $f(x) = (x-1)^2$; A(-2,1) B(-1,0)

$y = (x-1)^2$

A(-2,1)

L.S	R.S
y	$(x-1)^2$
$= 4$	$= (-2-1)^2$
	$= (-3)^2$
	$= 9$

L.S ≠ R.S

∴ A(-2,1) does not satisfy the equation.

B(-1,0)

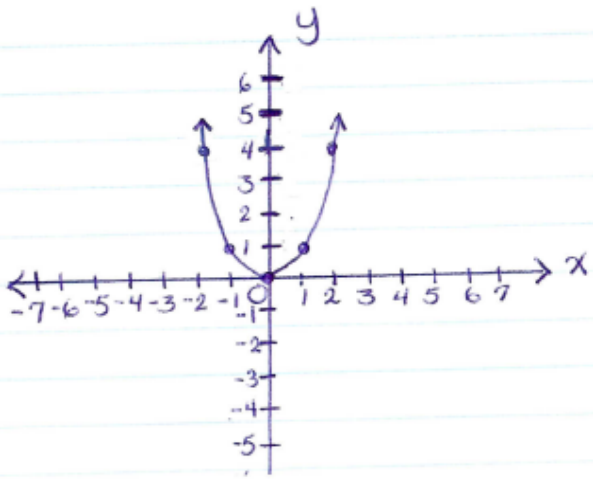
L.S	R.S
y	$(x-1)^2$
$= 0$	$= (-1-1)^2$
	$= (-2)^2$
	$= 4$

L.S. ≠ R.S.

∴ B(-1,0) does not satisfy the equation.

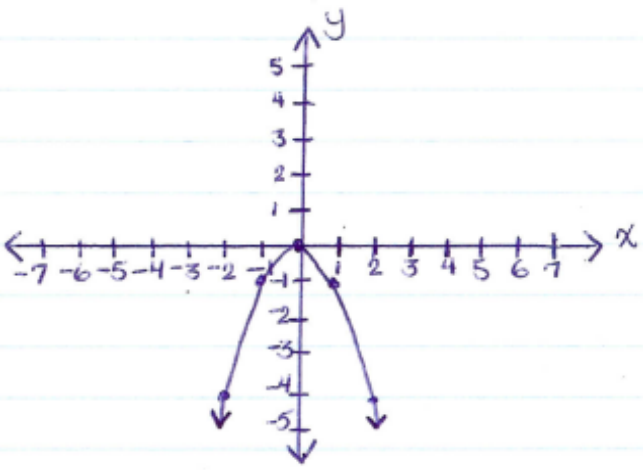
6a) A: $y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4



B: $y = -x^2$

x	y
-2	-4
-1	-1
0	0
1	-1
2	-4



b) Parabola A has a minimum point. Parabola B has a maximum point.

c) Parabola A opens upward.

7.a) $f: x \to 2x^2 + \frac{1}{2}$ b) $g: x \to -3x^2 + 1$

Opens Upward Opens Downward

c) $h: x \to 2(x-1)^2 - 1$

$= 2(x-1)(x-1) - 1$

$= (2x-2)(x-1) - 1$

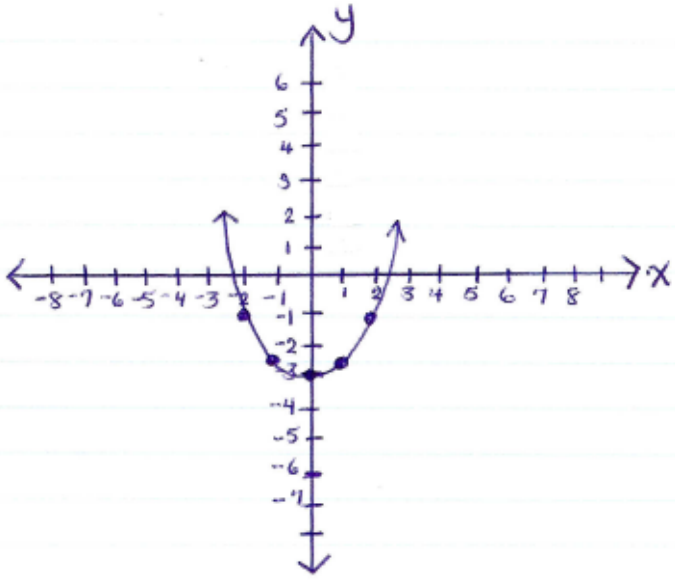
$= 2x^2 - 2x - 2x + 2 - 1$

$= 2x^2 - 4x + 1$

Opens Upward.

8a) $y = \frac{1}{2}x^2 - 3$

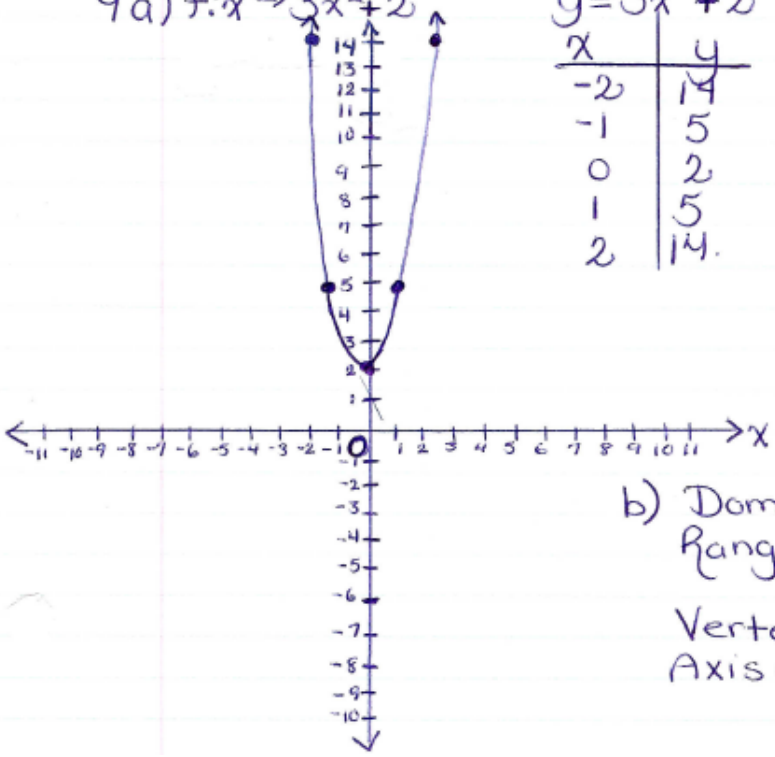
x	y
-2	-1
-1	-2.5
0	-3
1	-2.5
2	-1



b) Axis of Symmetry: x = 0

c) Minimum => (0,-3) OR y = -3

9a) $f: x \to 3x^2 + 2$



$y = 3x^2 + 2$

x	y
-2	14
-1	5
0	2
1	5
2	14.

b) Domain: $\{x \in R\}$
Range: $\{y \geq 2, y \in R\}$

Vertex $(0, 2)$
Axis of Symmetry: $x = 0$