112B MATH Review Chapter 1

Quadratics

I. State each of the following quadratics in transformational form.

Then give the coordinates of the vertex,
the equation of the axis of symmetry
the equation of the min/max

i) $y = 2(x - 4)^2 + 3$ ii) $y = -3(x + 2)^2 - 4$ iii) $y = \frac{1}{2}(x + 5)^2 + 7$ iv) $y = -\frac{3}{2}(x-1)^2 + 2$

II. State the following quadratics in standard form.

Then give the coordinates of the vertex,
the equation of the axis of symmetry
the equation of the min/max

i) $\frac{1}{3}y = (x + 2)^2$ ii) $\frac{1}{2}(y - 10) = (x + 3)^2$ iii) $-\frac{1}{3}(y + 2) = (x + 1)^2$ iv) $\frac{1}{5}(y+1) = (x-3)^2$

III. Complete the square to convert the following into the standard form.

Then give the coordinates of the vertex,
the equation of the axis of symmetry
the equation of the min/max
the coordinates of the y intercept
the domain and range

i) $y = x^2 - 6x - 5$ ii) $y = 2x^2 - 12x + 4$ iii) $y = x^2 + 12x + 4$ iv) $y = -x^2 - 2x + 3$

IV. State the vertex coordinates and the equation of the min / max

i) $y = x^2 + 4x - 2$ ii) $y = -2x^2 - 4x + 8$ iii) $y = 2x^2 - 10x + 6$

V. State the vertex coordinates, the equation of the min/max, the coordinates of the y intercept, the domain and range, and give the mapping rule for each of the following.

i) $y = x^2 + 4x + 5$ ii) $y = -x^2 + 14x - 15$ iii) $y = 3x^2 - 30x + 15$

i) $\frac{1}{2}(y - 3) = (x + 5)^2$ ii) $y = 5x^2 - 25x + 30$ iii) $y = 2x^2 + 3x - 6$

112 B Math Review A Ch. 1 Solutions.

I (i) $\frac{1}{2}(y-3) = (x-4)^2$ vertex $(4,3)$ $x=4$ $y=3$.

(ii) $-\frac{1}{3}(y+4) = (x+2)^2$ vertex $(-2,-4)$ $x=-2$ $y=-4$

(iii) $2(y-7) = (x+5)^2$ vertex $(-5,7)$ $x=-5$ $y=7$

(iv) $-\frac{2}{3}(y-2) = (x-1)^2$ vertex $(1,2)$ $x=1$ $y=2$

II (i) $y = 3(x+2)^2$ vertex $(-2,0)$ $x=-2$ $y=0$

(ii) $y = 2(x+3)^2+10$ " $(-3,10)$ $x=-3$ $y=10$

(iii) $y = -3(x+1)^2-2$ " $(-1,-2)$ $x=-1$ $y=-2$

(iv) $y = 5(x-3)^2-1$ " $(3,-1)$ $x=3$ $y=-1$

III (i) $y = x^2-6x+5-9$ (-3, $(-3)^2$)

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

vertex $(3,-4)$

eq of axis of symmetry $x=3$

eq. of min/max $y=-4$

y int $(0,5)$

domain $\{x \mid x \in R\}$

range $\{y \mid y \geq -4, y \in R\}$

(ii) $y = 2x^2-12x+4$

$\frac{1}{2}y = x^2-6x+2$ ($+9$, $(-3)^2$)

$\frac{1}{2}y = (x-3)^2-7$ ($(-3)^2$)

$y = 2(x-3)^2-14$

$(3,-14)$

$x=3$

$y=-4$

$(0,4)$

$\{x \mid x \in R\}$

$\{y \mid y \geq -14; y \in R\}$

(iii) $y = x^2+12x+4-36$ ($+36$, $(+6)^2$)

$y = (x+6)^2-32$

$(-6,-32)$

$x=-6$

$y=-32$.

$(0,4)$

$\{x \mid x \in R\}$

$\{y \mid y \geq -32; y \in R\}$

(iv) $y = -x^2-2x+3$

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

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

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

vertex $(-1,4)$ → min/max $y=4$

eq of axis of sym. $x=-1$ → y int $(0,3)$

$\{x \mid x \in R\}$ domain

$\{y \mid y \leq 4, y \in R\}$ range

IV (i) $y = x^2 + 4x - 2$

vertex $(-2; -6)$

(a) $x = \frac{-b}{2a}$

$= -\frac{(4)}{2(1)}$

$= -2$

(b) $y = x^2 + 4x - 2$ (sub $x = -2$)

$= (-2)^2 + 4(-2) - 2$

$= 4 - 8 - 2$

$= -6$

eq of min/max $y = -6$

(ii) $y = -2x^2 - 4x + 8$

vertex $(-1, 10)$

(a) $x = \frac{-b}{2a}$

$= \frac{-(-4)}{2(-2)}$

$= -1$

(b) (sub x) $y = -2x^2 - 4x + 8$

$y = -2(-1)^2 - 4(-1) + 8$

$= -2 + 4 + 8$

$= 10$

equation of min/max $y = 10$

(iii) $y = 2x^2 - 10x + 6$

vertex $\left(\frac{5}{2}; \frac{-13}{2}\right)$

(a) $x = \frac{-b}{2a}$

$\frac{-(-10)}{2(2)}$

$\frac{10}{4}$

$\frac{5}{2}$

(b) $2\left(\frac{5}{2}\right)^2 - 10\left(\frac{5}{2}\right) + 6$

$2\left(\frac{25}{4}\right) - 25 + 6$

$\frac{25}{2} - \frac{19}{1}$

$-\frac{13}{2}$

equation of min/max $y = -\frac{13}{2}$

V

	(i) $y = x^2 + 4x + 5$	(ii) $y = -x^2 + 14x - 15$	(iii) $y = 3x^2 - 30x + 15$
vertex	$(-2, 1)$	$(7, 34)$	$(5, -60)$
eq of min/max	$y = 1$	$y = 34$	$y = -60$
y int.	$(0, 5)$	$(0, -15)$	$(0, 15)$
domain	$\{x \mid x \in \mathbb{R}\}$	$\{x \mid x \in \mathbb{R}\}$	$\{x \mid x \in \mathbb{R}\}$
range	$\{y \mid y \geq 1; y \in \mathbb{R}\}$	$\{y \mid y \leq 34; y \in \mathbb{R}\}$	$\{y \mid y \geq -60, y \in \mathbb{R}\}$
mapping rule	$(x, y) \to (x - 2; y + 1)$	$(x, y) \to (x + 7; -y + 34)$	$(x, y) \to (x + 5; 3y - 60)$

	(i) $\frac{1}{2}(y - 3) = (x + 5)^2$	$y = 5x^2 - 25x + 30$	$y = 2x^2 + 3x - 6$
vertex	$(-5, 3)$	$\left(\frac{5}{2}, -\frac{5}{4}\right)$	$\left(-\frac{3}{4}; -\frac{39}{8}\right)$
eq of min/max	$y = 3$	$y = -\frac{5}{4}$	$y = -\frac{39}{8}$
y int	$(0, 53)$	$(0, 30)$	$(0, -6)$
domain	$\{x \mid x \in \mathbb{R}\}$	$\{x \mid x \in \mathbb{R}\}$	$\{x \mid x \in \mathbb{R}\}$
range	$\{y \mid y \geq 3; y \in \mathbb{R}\}$	$\{y \mid y \geq -\frac{5}{4}; y \in \mathbb{R}\}$	$\{y \mid y \geq -\frac{39}{8}; y \in \mathbb{R}\}$
mapping	$(x, y) \to (x - 5; 2y + 3)$	$(x, y) \to \left(x + \frac{5}{2}; 5y - \frac{5}{4}\right)$	$(x, y) \to \left(x - \frac{3}{4}; 2y - \frac{39}{8}\right)$