EXERCISES [MAI 2.2]

QUADRATICS

SOLUTIONS

Compiled by: Christos Nikolaidis

A. Paper 1 questions (SHORT)

	$f(x)=2x^2-12x+10$	$f(x)=2x^2-12x+18$	$f(x)=2x^2-12x+23$
y-intercept	$y=10$	$y=18$	$y=23$
Roots	1, 5	3 (double),	No real roots,
Factorisation (if possible)	$f(x)=2(x-1)(x-5)$	$f(x)=2(x-3)^2$	No factorization
axis of symmetry	$x=3$	$x=3$	$x=3$
Vertex	V(3,-8)	V(3,0)	V(3,5)
Vertex form $f(x)=a(x-h)^2+k$	$f(x)=2(x-3)^2-8$	$f(x)=2(x-3)^2$	$f(x)=2(x-3)^2+5$
Solve $f(x)\geq 0$	$x\leq 1$ or $x\geq 5$	$x\in R$	$x\in R$
Solve $f(x)>0$	$x<1$ or $x>5$	$x\in R-\{3\}$	$x\in R$
Solve $f(x)\leq 0$	$1\leq x\leq 5$	$x=3$	No solutions (It is always positive)
Solve $f(x)<0$	$1<x<5$	No solutions (It is always positive or 0)	No solutions (It is always positive)

2. (a) (i) $x=10$ $x=20$

(ii) $y=4(x-10)(x-20)$

(b) (i) (15,-100)

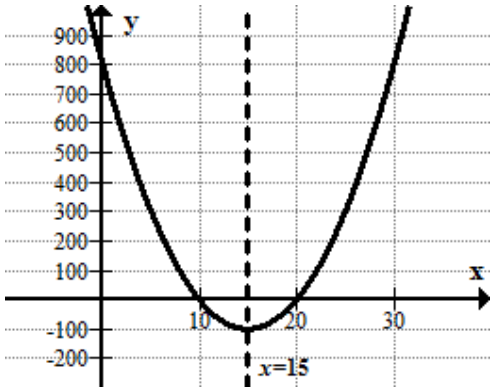
(ii) $y=4(x-15)^2-100$

(iii) $x=15$

(iv) $y_{\min}=-100$

(c) $y=800$

(d)



3. (a) (i) $x = 10 \quad x = 20$

(ii) $y = -4(x-10)(x-20)$

(b) (i) (15, 100)

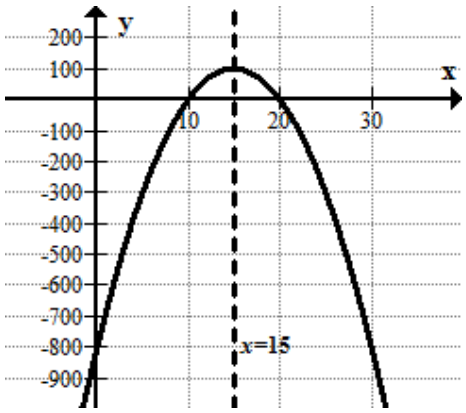
(ii) $y = -4(x-15)^2 + 100$

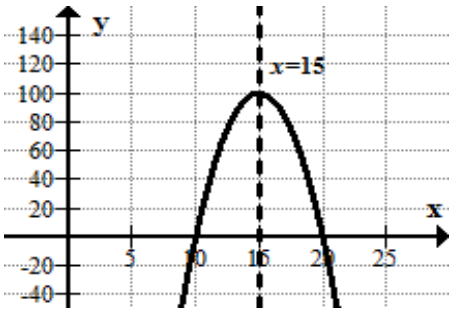
(iii) $x = 15$

(iv) $y_{\max} = 100$

(c) $y = -800$

(d)





4. (a) $x = 4$

(b) $y = 12$ since (8,12) is symmetric to (0,12) about $x = 4$

(c) $y = 5$ since (1,5) is symmetric to (7,5) about $x = 4$

5. (a) $x = 5$ or $x = -2$

(b) $x^2 - 3x - 10 = (x-5)(x+2)$

6. (a) $p = -\frac{1}{2}, q = 2$ or vice versa

(b) By symmetry C is midway between p, $q \Rightarrow$ x-coordinate is $\frac{-\frac{1}{2}+2}{2} = \frac{3}{4}$

7. (a) intercepts are (–1, 0) and (2, 0) (accept $x = -1$, $x = 2$)

(b) $x_v = \frac{x_1 + x_2}{2}$, $x_v = -\frac{b}{2a}$,

$x_v = 0.5$

8. $(7-x)(1+x) = 0 \Leftrightarrow x = 7$ or $x = -1$

B: $x = \frac{7+-1}{2} = 3$;

$y = (7-3)(1+3) = 16$

9. (a) 4 and 0 (accept (4, 0) and (0, 0), or $x = 4$, $x = 0$)

(b) (i) $x = 2$ (must be equation)

(ii) substituting $x = 2$ into $f(x)$, $y = 8$

10.

Expression	+ – 0
a	–
c	–
$b^2 - 4ac$	0
$-\frac{b}{2a}$	+
b	+

11.

Expression	+ – 0
a	–
c	0
$b^2 - 4ac$	+
$-\frac{b}{2a}$	+
b	+

12.

Expression	+ – 0
a	+
c	–
$b^2 - 4ac$	+
$-\frac{b}{2a}$	+
b	–

13. (a) Vertex is (3, 5)

(b) $f(x) = (x - 3)^2 + 5$

14. (a) $f(x) = 2(x - 2)^2 - 3$ i.e. $a = 2,\ p = 2,\ q = -3$

(b) Minimum value of $f(x) = -3$ **OR** Minimum value occurs at (2, –3)

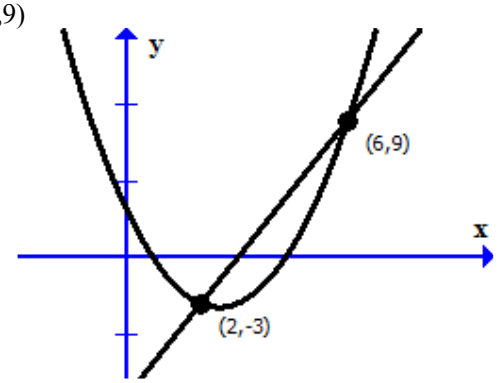
15. (a) Vertex is (– 0.5, 1.5)

(b) $f(x) = 2(x + 0.5)^2 + 1.5$

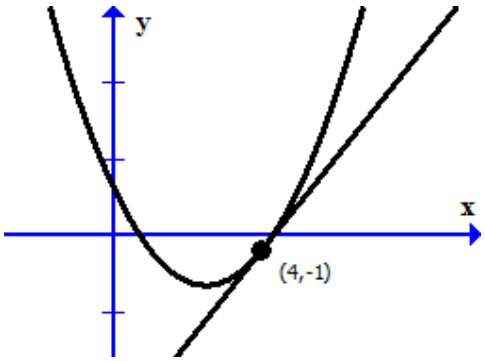
16. (a) Vertex is (– 0.5, – 0.75)

(b) $f(x) = -(x + 0.5)^2 - 0.75$

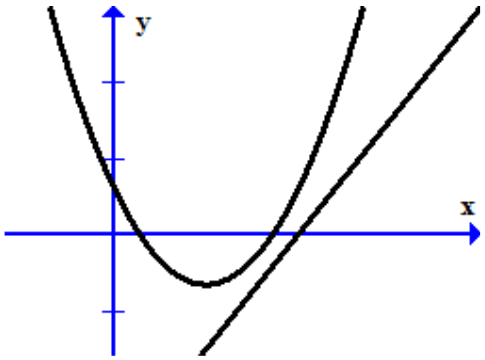
17. (2,-3) and (6,9)



18. (4,-1)



19. no points of intersection



20. (-2,1) and (2,1)