

Quadratic Practice

Answer Key - Leave UP Front!!

1. [7 marks]

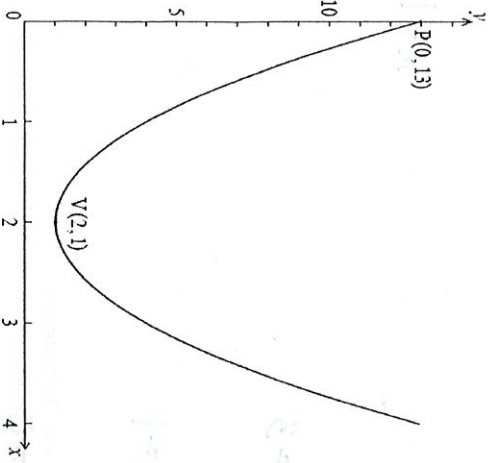
Consider the equation $x^2 + (k - 1)x + 1 = 0$, where k is a real number.

Find the values of k for which the equation has two equal real solutions.

$k = -1, 3$

2a. [4 marks]

The following diagram shows the graph of a quadratic function f , for $0 \leq x \leq 4$.



The graph passes through the point $P(0, 13)$, and its vertex is the point $V(2, 1)$.

The function can be written in the form $f(x) = a(x - h)^2 + k$.

(i) Write down the value of h and of k .

$h = 2, k = 1$

(ii) Show that $a = 3$.

Hint: Plug point P into vertex form & solve for "a".

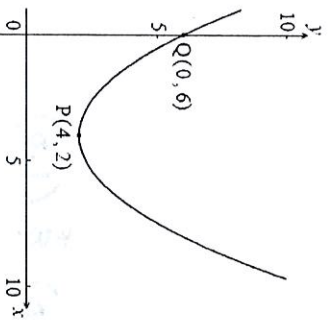
2b. [3 marks]

Find $f(x)$, giving your answer in the form $Ax^2 + Bx + C$.

$f(x) = 3x^2 - 12x + 13$

3a. [1 mark]

Let f be a quadratic function. Part of the graph of f is shown below.



The vertex is at $P(4, 2)$ and the y -intercept is at $Q(0, 6)$.

Write down the equation of the axis of symmetry.

$x = 4$

3b. [2 marks]

The function f can be written in the form $f(x) = a(x - h)^2 + k$.

Write down the value of h and of k .

$h = 4, k = 2$

3c. [3 marks]

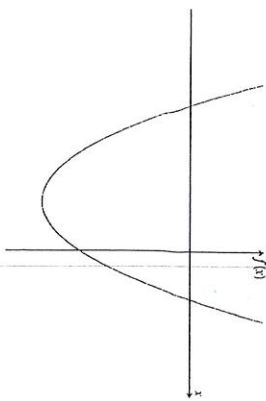
The function f can be written in the form $f(x) = a(x - h)^2 + k$.

Find a .

$a = \frac{1}{4}$

4a. [6 marks]

The diagram below shows part of the graph of $f(x) = (x-1)(x+3)$.



7a) Write down the x -intercepts of the graph of f .

$(-3, 0)$ & $(1, 0)$

7b) Find the coordinates of the vertex of the graph of f .

$(-1, 4)$

4b. [2 marks] Write down the x -intercepts of the graph of f .

4c. [4 marks] Find the coordinates of the vertex of the graph of f .

5a. [2 marks] Let $f(x) = a(x-h)^2 + k$. The vertex of the graph of f is at $(2, 3)$ and the graph passes through $(1, 7)$. Write down the value of k .

$h = 2, k = 3$

5b. [3 marks] Find the value of a .

$a = 4$

6a. [2 marks]

Let $f(x) = 3x^2 - 6x + p$. The equation $f(x) = 0$ has two equal roots.

Write down the value of the discriminant

discriminant = 0

6b. [1 mark]

Hence, show that $p = 3$.

Set $b^2 - 4ac = 0$ & solve

6c. [4 marks]

The graph of f has its vertex on the x -axis. Find the coordinates of the vertex of the graph of f .

$(1, 0)$

6d. [1 mark]

The graph of f has its vertex on the x -axis. Write down the solution of $f(x) = 0$.

$x = 1$

6e. [1 mark]

The graph of f has its vertex on the x -axis. The function can be written in the form $f(x) = a(x-h)^2 + k$. Write down the value of a .

$a = 3$

6f. [1 mark]

The graph of f has its vertex on the x -axis. The function can be written in the form $f(x) = a(x-h)^2 + k$. Write down the value of h .

$h = 1$

6g. [1 mark]

The graph of f has its vertex on the x -axis. The function can be written in the form $f(x) = a(x-h)^2 + k$. Write down the value of k .

$k = 0$

7a. [3 marks]

Let $f(x) = 2x^2 + 4x - 6$.

Express $f(x)$ in the form $f(x) = 2(x-h)^2 + k$.

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

7b. [1 mark]

Write down the equation of the axis of symmetry of the graph of f .

$x = -1$

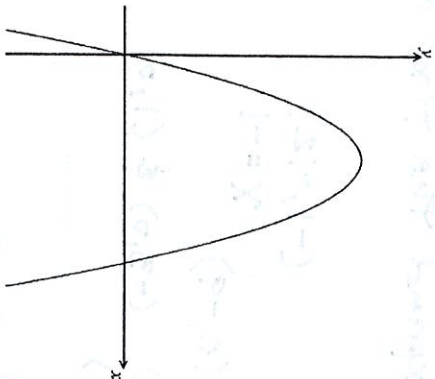
7c. [2 marks]

Express $f(x)$ in the form $f(x) = 2(x-p)(x-q)$.

$2(x+3)(x-1)$

8a. [4 marks]

Let $f(x) = 8x - 2x^2$. Part of the graph of f is shown below.



$(4,0)$ & $(0,0)$

8b. [3 marks]

(i) Write down the equation of the axis of symmetry.

$x = 2$

(ii) Find the y-coordinate of the vertex.

$y = 8$

9a. [5 marks]

Consider $f(x) = 2kx^2 - 4kx + 1$, for $k \neq 0$. The equation $f(x) = 0$ has two equal roots.

Find the value of k .

$k = \frac{1}{2}$

9b. [2 marks]

The line $y = p$ intersects the graph of f . Find all possible values of p .

$p \geq 0$

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10. Consider $f(x) = 2 - x^2$ and $g(x) = x^2 + x + 1$.

(a) Solve $f(x) = g(x)$.

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

$2x^2 + x - 1 = 0$

$(2x - 1)(x + 1) = 0$

$x = -1, \frac{1}{2}$

(b) Write down the set of values of x such that $f(x) > g(x)$.

$2 - x^2 > x^2 + x + 1$

$0 > 2x^2 + x - 1$

$2x^2 + x - 1 < 0$

$(2x - 1)(x + 1) < 0$

$\frac{-1}{2} < x < \frac{1}{2}$

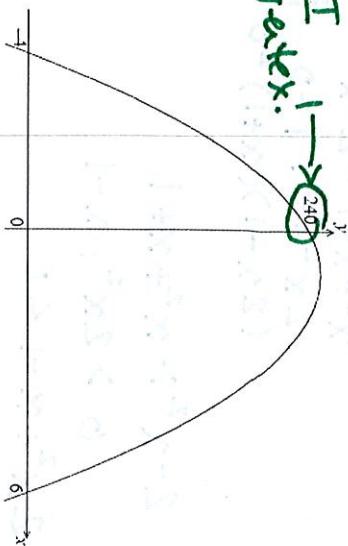
$-1 < x < \frac{1}{2}$

You have a quiz on Thursday 9/14 (A day) or Friday 9/15 (B day).

A practice quiz is included on the back of the packet. Please use this practice quiz plus all other materials given to prepare yourself. There will be time to ask a few questions in class before we begin the quiz, but it is ALWAYS best to have more processing time.

For additional practice problems, use the Review Sets for Ch. 1 in the online textbook. They begin on Pg. 49.

1. The following diagram shows part of the graph of a quadratic function f .



The x -intercepts are at $(-4, 0)$ and $(6, 0)$ and the y -intercept is at $(0, 240)$.

- (a) Write down $f(x)$ in the form $f(x) = -10(x-p)(x-q)$ $y = -10(x+4)(x-6)$ (2)
- (b) Find another expression for $f(x)$ in the form $f(x) = -10(x-h)^2 + k$ $y = -10(x-4)^2 + 250$ (4)
- (c) Show that $f(x)$ can also be written in the form $f(x) = 240 + 20x - 10x^2$.
 $-10(x+4)(x-6)$
 $-10(x^2 - 2x - 24)$
 $-10x^2 + 20x + 240$ (2)
2. The equation $x^2 - 2kx + 1 = 0$ has two distinct real roots. Find the set of all possible values of k . (Total 6 marks)

$$(-2k)^2 - 4(1)(1) > 0$$

$$4k^2 - 4 > 0$$

$$4(k^2 - 1) > 0$$

$$4(k+1)(k-1) > 0$$

$$+ \quad - \quad +$$

$$\frac{-1}{-1} \quad \frac{-1}{1}$$

$$k < -1 \text{ or } k > 1$$

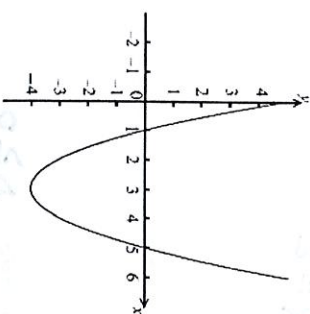
(Total 6 marks)

3. Let $f(x) = 3(x+1)^2 - 12$. ↪ expand the $f(x)$ above (2)
- (a) Show that $f(x) = 3x^2 + 6x - 9$.

- (b) For the graph of f
- (i) write down the coordinates of the vertex; $(-1, -12)$
- (ii) write down the equation of the axis of symmetry; $x = -1$
- (iii) write down the y -intercept; $(0, -9)$
- (iv) find both x -intercepts; $3(x^2 + 2x - 3) \quad (-3, 0) \text{ \& } (1, 0)$
 $3(x+3)(x-1)$ (8)
- (c) Hence sketch the graph of f . Be sure to label the coordinates of the x and y intercepts and vertex. (2)

(Total 12 marks)

4. The following diagram shows part of the graph of a quadratic function, with equation in the form $y = (x-p)(x-q)$, where $p, q \in \mathbb{Z}$.



- (a) Write down
- (i) the value of p and of q ; $p = 1 \text{ or } p = 5$
 $q = 5 \text{ or } q = 1$
- (ii) the equation of the axis of symmetry of the curve. $x = 3$ (3)

- (b) Find the equation of the function in the form $y = (x-h)^2 + k$, where $h, k \in \mathbb{Z}$. (3)

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

(Total 6 marks)