# Practice for Quadratics

**1a.** *[3 marks]*

A quadratic function  can be written in the form . The graph of  has axis of symmetry  and -intercept at 

Find the value of .

**1b.** *[3 marks]*

Find the value of .

**1c.** *[8 marks]*

The line  is a tangent to the curve of . Find the values of .

**2a.** *[2 marks]*

Let .

Find the equation of the axis of symmetry of the graph of .

**2b.** *[4 marks]*

The function can also be expressed in the form .

(i)     Write down the value of .

(ii)     Find the value of .

**3a.** *[2 marks]*

Consider . The graph of  has a minimum value when .

The distance between the two zeros of  is 9.

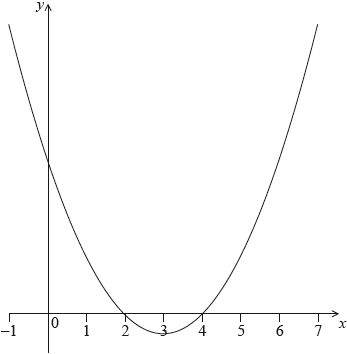
Show that the two zeros are 3 and .

**3b.** *[4 marks]*

Find the value of  and of .

**4a.** *[2 marks]*

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



The vertex is at  and the -intercepts at 2 and 4.

The function  can be written in the form .

Write down the value of  and of .

**4b.** *[2 marks]*

The function can also be written in the form .

Write down the value of  and of .

**4c.** *[2 marks]*

Find the -intercept.

**5a.** *[2 marks]*

Let . The vertex of the graph of  is at  and the graph passes through .

Write down the value of and of .

**5b.** *[3 marks]*

Find the value of .

**6a.** *[2 marks]*

Let . The equation  has two equal roots.

Write down the **value** of the discriminant.

**6b.** *[1 mark]*

Hence, show that .

**6c.** *[4 marks]*

The graph of has its vertex on the -axis.

Find the coordinates of the vertex of the graph of .

**6d.** *[1 mark]*

The graph of  has its vertex on the -axis.

Write down the solution of .

**6e.** *[1 mark]*

The graph of  has its vertex on the -axis.

The function can be written in the form . Write down the value of .

**6f.** *[1 mark]*

The graph of  has its vertex on the -axis.

The function can be written in the form . Write down the value of .

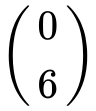
**6g.** *[1 mark]*

The graph of  has its vertex on the -axis.

The function can be written in the form . Write down the value of .

**6h.** *[4 marks]*

The graph of  has its vertex on the -axis.

The graph of a function  is obtained from the graph of  by a reflection of  in the -axis, followed by a translation by the vector . Find , giving your answer in the form .

**7.** *[6 marks]*

The equation  has two distinct real roots. Find the possible values of *k* .

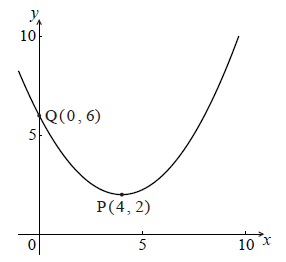
**8.** *[7 marks]*

Consider the equation  , where *k* is a real number.

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

**9a.** *[1 mark]*

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



The vertex is at P(, ) and the *y*-intercept is at Q(, ) .

Write down the equation of the axis of symmetry.

**9b.** *[2 marks]*

The function *f* can be written in the form  .

Write down the value of *h* and of *k* .

**9c.** *[3 marks]*

The function *f* can be written in the form  .

Find *a* .

**10a.** *[4 marks]*

Let  , where  .

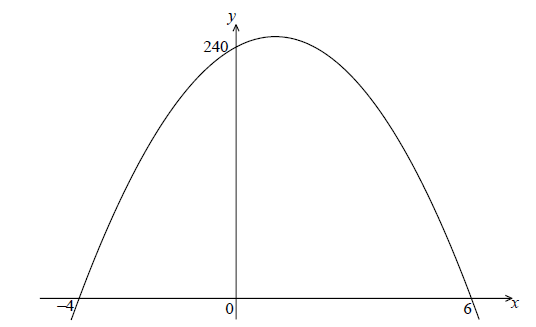
Find the values of *k* such that  has two equal roots.

**10b.** *[4 marks]*

Each value of *k* is equally likely for  . Find the probability that  has no roots.

**11a.** *[2 marks]*

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



The *x*-intercepts are at  and  , and the *y*-intercept is at  .

Write down  in the form  .

**11b.** *[4 marks]*

Find another expression for  in the form  .

**11c.** *[2 marks]*

Show that  can also be written in the form  .

**11d.** *[7 marks]*

A particle moves along a straight line so that its velocity,  , at time *t* seconds is given by  , for  .

(i)     Find the value of *t* when the speed of the particle is greatest.

(ii)    Find the acceleration of the particle when its speed is zero.

**12a.** *[2 marks]*

Let  . The graph of *f* is translated 1 unit to the right and 2 units down. The graph of *g* is the image of the graph of *f* after this translation.

Write down the coordinates of the vertex of the graph of *g* .

**12b.** *[2 marks]*

Express *g* in the form  .

**12c.** *[2 marks]*

The graph of *h* is the reflection of the graph of *g* in the *x*-axis.

Write down the coordinates of the vertex of the graph of *h* .

**13a.** *[3 marks]*

Let  .

Express  in the form  .

**13b.** *[1 mark]*

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

**13c.** *[2 marks]*

Express  in the form  .

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