Year 10 Term 2 Homework

Student Name: _____	**Grade**: _____
Date: _____	**Score**: _____

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3 Year 10 Term 2 Week 3 Homework

3.1 Graphs in the number plane

3.1.1 The parabola

- Many parabolas with equations of the form $y = ax^2 + bx + c$ cut the x-axis at two distinct points. These parabolas can be sketched by finding the x and y intercepts and the vertex, then drawing a smooth curve through these points.
- The equation of the axis of symmetry is given by: $x = \frac{-b}{2a}$
- To find the y co-ordinate of the vertex, substitute $x = \frac{-b}{2a}$ into the equation of the parabola.

Exercise 3.1.1 Find the x-intercepts of each of these parabolas. Answer in simplest surd form.

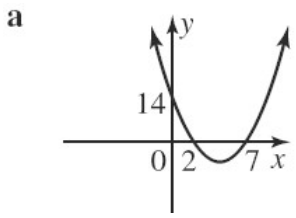
1. $y = x^2 - 10x + 18$

2. $y = x^2 - 6x - 4$

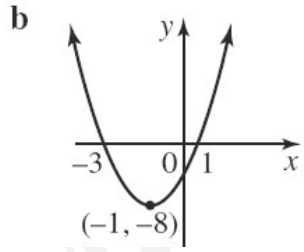
3. $y = x^2 + 8x + 4$

Exercise 3.1.2 Find the equation of each parabola in the form $y = k(x - a)(x - b)$.

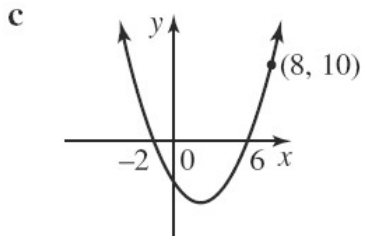
1. *Figure a*



2. *Figure b*



3. *Figure c*



3.1.2 The minimum and maximum value of a quadratic function

- The quadratic function $y = ax^2 + bx + c$ is represented graphically by a parabola.
- **Minimum:** If $a > 0$, the curve is concave up and the vertex is a minimum turning point.
- **Maximum:** If $a < 0$, the curve is concave down and the vertex is a maximum turning point.

Exercise 3.1.3 Find the maximum or minimum value of each of the following quadratic equations:

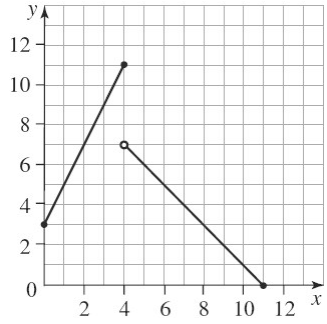
1. $y = 2x^2 - 3x + 5$

2. $y = -4x^2 - 12x - 11$

3. $y = 5 - 2x - 3x^2$

3.1.3 Miscellaneous exercises

Exercise 3.1.4 This piecemeal graph is made up of two straight line graphs, as shown.



1. *Find the value of y if:*

   (a) x = 4 _____

   (b) x = 6 _____

   (c) x = 10 _____

2. *Find the value(s) of x if*

   (a) y = 3 _____

   (b) y = 5 _____

   (c) y = 9 _____

3. *Find the equation of each section of the graph and state the restrictions on the value of x in each case.*

Exercise 3.1.5 Find the equation of the parabola that passes through the points (0, -12), (6, 0) and (-2, 0). [Hint: Start $y = ax^2 + bx + c$ and find c first.]

Exercise 3.1.6 For each of these equations, find:

1. $y = x^2 + 2x - 3$

   (a) *the y-intercept* _____

   (b) *the x-intercept* _____

   (c) *the axis of symmetry* _____

   (d) *the vertex*

   _____

   _____

2. $y = 2x^2 + 4x + 3$

   (a) *the y-intercept* _____

   (b) *the x-intercept*

   _____

   _____

   (c) *the axis of symmetry* _____

   (d) *the vertex*

   _____

   _____

3. $y = -x^2 + 4x$

   (a) *the y-intercept* _____

   (b) *the x-intercept* _____

   (c) *the axis of symmetry* _____

   (d) *the vertex*

   _____

   _____

Exercise 3.1.7 Simplify radicals and express each answer with rational exponents:

1. $\sqrt{x} + 2\sqrt{x^3}$

2. $(\frac{x^{\frac{1}{2}}}{y^2})^4(\frac{y^{\frac{1}{3}}}{x^{-\frac{2}{3}}})^3$

3. $\sqrt{1+x^2} - \frac{1}{\sqrt{1+x^2}}$

Exercise 3.1.8 Given the equation of the line L:

1. *The line passes through points (-1, 2) and (1, -4).*

2. *The line passes through the point (3, 2) and is parallel to the line:* $y = -3x + 2$.

3. *The line has the y-intercept* -5 *and is perpendicular to the line:* $2x + 5y = 1$.

Exercise 3.1.9

1. *Find the equation of the line passing through the point (2, 7) and parallel to the line* $2x - 3y = 8$.

2. *Express* $\frac{6+\sqrt{2}}{3+\sqrt{2}}$ *as a fraction with a rational denominator.*

3. *Solve the equation* $x + \frac{1}{x} = 3$. *(Leave answers in surd form.)*

4. *Find the discriminant of the following equation and state whether the roots are real*
$$2x^2 + 3x + 5 = 0.$$

5. *Find the axis of symmetry and the vertex of the parabola* $y = 5x^2 + 10x + 2$.

Exercise 3.1.10

1. *Express $\sqrt{45}+\sqrt{80}$ in the form $a\sqrt{5}$ and hence find the value of a.*

2. *Express $\frac{4+\sqrt{3}}{2+\sqrt{3}}$ in the form $a+b\sqrt{3}$ and hence find the value of a and b.*

3. *By Express $\frac{4}{2+\sqrt{5}}-\frac{1}{9-4\sqrt{5}}$ in its simplest form show that it is a rational number.*

4. *Without sketching, determine whether the following curves cross the x-axis or not: $y=5x^2-4x+3$.*

5. *Express $\frac{x+1}{x^2-x}-\frac{x-1}{x^2+x}$ as a fraction in its lowest terms.*