Name: ……

Workbook Tests

You will need to complete each of the following tests BEFORE the start of the Autumn term.

This must then be handed in at the beginning of your first A-level maths lesson.

There will be an assessment early on in the term.

At the end of each of your 6 weeks of work over the summer, there is one test to do in this pack (for the first week, there are two tests- surds and indices)

Your teacher will complete the following for you when they have marked your tests:

TOPIC	MARK OUT OF 20
Surds	
Indices	
Rational Expressions	
Notation and Proof	
Transformations of Graphs	
Coordinate Geometry	
Quadratics	

End of Topic Assessment Test – Surds [20 MARKS] /20

Questions 1-5 are multiple choice. Circle the letter A, B, C or D that corresponds to the correct answer.

1. Which of the following is a rational number:

A. $\sqrt{36}$ B. $\sqrt{48}$ C. $\sqrt{3}$ D. π **[1]**

2. Which if the following is the simplest form of $\sqrt{2}+1-2\sqrt{3}+4\sqrt{2}-3$?

A. $3\sqrt{2}-2$ B. $5\sqrt{2}-2\sqrt{3}-2$ C. $3\sqrt{7}-2$ D. $\sqrt{7}$ **[1]**

3. Which of the following is equivalent to $2\sqrt{p}-\sqrt{q}-\sqrt{p}+\sqrt{9q}$

A. $2\sqrt{q}+\sqrt{9q}$ B. $2-\sqrt{q}+\sqrt{9q}$ C. $\sqrt{p}+\sqrt{8q}$ D. $\sqrt{p}+2\sqrt{q}$ **[1]**

4. The expression $\frac{2+\sqrt{3}}{1+\sqrt{2}}$ is equivalent to:

A. 5 B. $2\sqrt{2}+\sqrt{6}-\sqrt{3}-2$ C. $2+\sqrt{3}-2\sqrt{2}-\sqrt{6}$ D. $\frac{2+\sqrt{3}}{5}$ **[1]**

5. Which expression is equivalent to $\frac{x+\sqrt{y}}{x-\sqrt{y}}$?

A. -1 B. $\frac{x^2+x\sqrt{y}+y}{x^2-y}$ C. $\frac{x^2+2x\sqrt{y}+y}{x^2-y}$ D. $\frac{x^2+y}{x^2-y}$ **[1]**

For questions 6-10 you need to show your working clearly as well as correct answers to get full marks.

6. If p is an unknown prime number, write the expression $\frac{2}{\sqrt{p}}$ with a rational denominator.

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[2]

7. Write $\sqrt{a^2} + \sqrt{4a^2}$ in the form ka for some constant k.

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..... **[3]**

8. Express $\frac{\sqrt{2}+3}{\sqrt{2}-1}$ in the form $x + y\sqrt{2}$ where x and y are integers to be found.

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9. The expression $\frac{2}{3\sqrt{2}}$ can be written in its simplest possible form as $\frac{a}{b}\sqrt{2}$, where a and b are integers. Find the value of a and the value of b.

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Answer: a = ... b = ... **[3]**

10. Find 2 new ways of writing the number $2\sqrt{72}$ in the form $a\sqrt{b}$ where a and b are integers.

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End of Topic Assessment Test – Indices [20 MARKS] /20

Questions 1-5 are multiple choice. Circle the letter A, B, C or D that corresponds to the correct answer.

1. Which of these statements correctly describes 6^7

A. The base is 7 and the power is 6.

B. The base is 6 and the power is 7.

C. The base is 7 and the index is 6.

D. The index is 6 and the power is 7. **[1]**

2. If $2^p \times 2^P = 2^q$, which one of the following would correctly describe the relationship between p and q.

A. $p = q$ B. $2p = q$ C. $p^2 = q$ D. $p = 2q$ **[1]**

3. $(5^{20})^5 \div 5$ is the same as which one of the following:

B. 5^{24} B. 5^{26} C. 5^{99} D. 1^{100} **[1]**

4. If $\frac{a^6}{b^3} = a^p b^q$ for two different prime numbers a and b, then which one of the following must be true:

A. $p = 6\,,\ q = 3$ B. $p = -6\,,\ q = 3$ C. $p = 6\,,\ q = -3$ D. $p = -6\,,\ q = -3$ **[1]**

5. Which one of the four statements below is correct.

A. $2^{-p} = -2^p$ for all positive integer values of a and p.

B. $100^{\frac{1}{2}} = 50$

C. $\frac{1}{2^p} = \sqrt[p]{2}$ for all positive integer values of p.

D. $p^{\frac{1}{3}} = \sqrt[3]{p}$ for all values of p. **[1]**

For questions 6-10 you need to show your working clearly to get full marks.

6. Simplify $5^{5/2} + 5^{1/2}$

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[3]

7. Write $\sqrt{\frac{x^{2/3}}{x^{1/3} \times x^{11/3}}}$ in the form x^p.

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8. Simplify $(2x^4)^3 + \sqrt[3]{x^3} + 7^0$

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9. Find the value of x given that $2^{4-x} = 8^{x+3}$

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10. Solve the equation $2^{2x} - 9(2^x) + 8 = 0$

HINT: What is the relationship between 2^x and 2^{2x} ?

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End of Topic Assessment Test – Proof [20 MARKS] /20

Questions 1-7 are multiple choice. Circle the letter A, B, C or D that corresponds to the correct answer.

1. Which one of the following is correct ?

   A. An integer ends in 2 $\Leftrightarrow$ the integer is even.
   B. An integer is even $\Leftrightarrow$ the integer is a multiple of 2.
   C. An integer is greater than 10 $\Leftrightarrow$ the integer is 11.
   D. An integer ends in 3 $\Leftrightarrow$ the integer is a multiple of 3.

   [1]

2. Which one of the following is correct ?

   A. K is a multiple of 4 $\Rightarrow$ K is a multiple of 2
   B. K is a multiple of 2 $\Rightarrow$ K is a multiple of 2
   C. K is a multiple of 3 $\Rightarrow$ K is a multiple of 2
   D. K is a multiple of 3 $\Rightarrow$ K is a multiple of 0 **[1]**

3. Which of the following is correct ?

   A. $x = 4 \quad \Leftarrow \quad x^2 = 16$
   B. T is a square $\Leftarrow$ T is a 4 sided polygon
   C. $x = -4 \quad \Leftarrow \quad x^2 = 16$
   D. T is a 4 sided polygon $\Leftarrow$ T is a square **[1]**

4. A proof begins with the statement: Let y = 2n + 1 , where n is an integer.

   What does y represent ?

   A. Any integer
   B. Any even number
   C. Any odd number
   D. Any multiple of 3.

   [1]

5. If k can be any integer, which of the following oculd be used to represent two consecutive square numbers?

   A. k^2 and $(k+1)^2$
   B. k^2 and $k^2 + 1$
   C. k^2 and $k^2 + 1^2$
   D. k^2 and $(k^2 + 1)$

   [1]

6. Which value of x is a counter example for the statement "$x^2 + x + 5$ is always a prime number" ?

   A. $x = 1$
   B. $x = 2$
   C. $x = 3$
   D. $x = 4$ **[1]**

7. Which one of these statements is always true.

   A. n^2 is an odd number for any integer n
   B. If n is even then $n^2 + n$ is a multiple of 6
   C. If n is odd then $n^2 - n$ is an odd number
   D. If n is even then $n^2 + n$ is an even number **[1]**

8. Prove that the sum of three consecutive integers is always a multiple of 3.

[4]

9. Prove by exhaustion that the difference between any two consecutive square numbers between 1 and 50 is always odd.

[3]

11. Prove that the difference between any two consecutive square numbers will always be odd.

[3]

12. Prove that the difference between the cube of an integer and the integer itself is always a multiple of 6.

[Remember: the product of numbers is found by multiplying them together. So the product of 4 & 3 is 12]

[3]

End of Topic Assessment Test – Rational Expressions [20 MARKS] /20

Questions 1-3 are multiple choice. Circle the letter A, B, C or D that corresponds to the correct answer.

1. For non-zero integers a, the rational expression $\frac{12a^3-16a^2}{2a}$ is always

A. a multiple of $2a$. B. a multiple of $4a^2$ C. a multiple of $(3a+4)$ D. a multiple of 4

[1]

2. The lowest common denominator of $\frac{2}{x}$, $\frac{3}{x-1}$ and $\frac{4}{x^2-1}$ is:

A. x B. $x(x-1)$ C. $x(x-1)(x^2-1)$ D. $x(x-1)(x+1)$

[1]

3. The solutions of $\frac{6}{x+2}-\frac{3}{x^2+2x}=1$ are:

A. $x=-2\ or\ x=0$ B. $x=1\ or\ x=0$ C. $x=1\ or\ x=2$ D. $x=1\ or\ x=3$

[1]

For questions 4-10 you need to show your working clearly as well as correct answers to get full marks.

4. Express $\frac{x}{y}+\frac{y}{x}$ as a single fraction in its simplest form,

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5. Write as a single fraction in its simplest form $\frac{x^2-4}{3y^2+y} \times \frac{3y^2-2y-1}{x^2+x-6}$

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6.

$f(x) = \frac{2}{x-3} + \frac{13}{x^2+4x-21}$

Find the value(s) of x for which $f(x) = 1$.

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7.

Express $\frac{x}{2x+1} + 3$ in the form $\frac{px+q}{2x+1}$

where p and q are integers.

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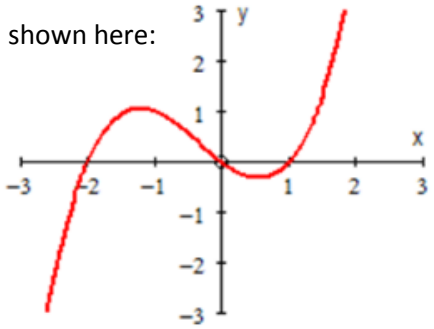
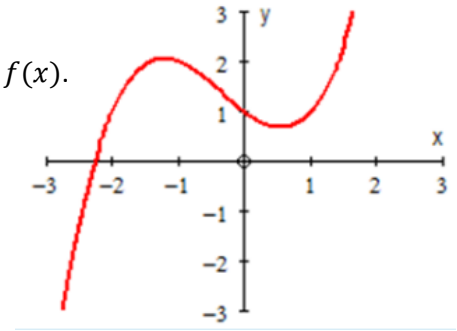
End of Topic Assessment Test – Transforming Graphs [20 MARKS] /20

Questions 1-5 are multiple choice and all are related to the graph of $y = f(x)$ is shown here:



Circle the letter A, B, C or D that corresponds to the correct answer.

1. The graph given to the right here is a transformation of the graph $y = f(x)$.



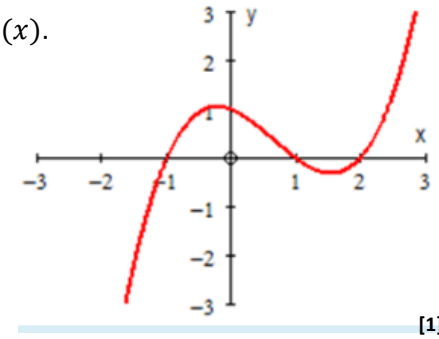
The equation of this new graph is given by:

A. $y = f(x) + 1$ B. $y = f(x + 1)$

C. $y = f(x) - 1$ D. $y = f(x - 1)$

[1]

2. The graph given to the right here is a transformation of the graph $y = f(x)$.



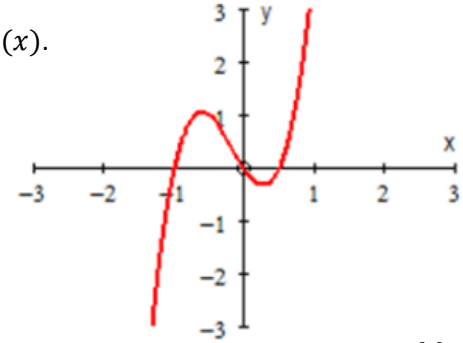
The equation of this new graph is given by:

A. $y = f(x) + 1$ B. $y = f(x + 1)$

C. $y = f(x) - 1$ D. $y = f(x - 1)$

[1]

3. The graph given to the right here is a transformation of the graph $y = f(x)$.



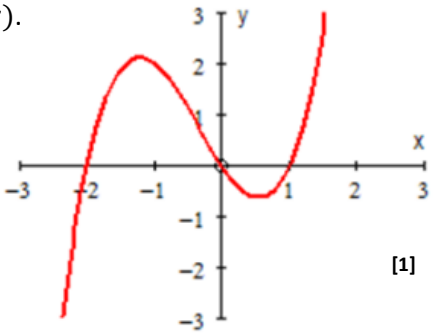
The equation of this new graph is given by:

A $y = 2f(x)$ B. $y = f(2x)$

C. $y = \frac{1}{2}f(x)$ D. $y = f(\frac{1}{2}x)$

[1]

4. The graph given to the right here is a transformation of the graph $y = f(x)$.



The equation of this new graph is given by:

A. $y = 2f(x)$ B. $y = f(2x)$

C. $y = \frac{1}{2}f(x)$ D. $y = f(\frac{1}{2}x)$

[1]

5. The graph of $y = -x^2$ is the graph of $y = x^2$ transformed by …

A. Reflected in the y-axis.
B. Reflected in the x-axis.
C. Reflected in the line $y = x$
D. Reflected in the line $y = -x$ **[1]**

6. The graph of $y = 2\sin(x - 45)$ is the graph of $y = sinx$ transformed by …

A. A translation of $\begin{pmatrix} -45 \\ 0 \end{pmatrix}$ then a stretch by factor 2 parallel to the y-axis.
B. A translation of $\begin{pmatrix} 0 \\ 45 \end{pmatrix}$ then a stretch by factor ½ parallel to the y-axis.
C. A translation of $\begin{pmatrix} 0 \\ 45 \end{pmatrix}$ then a stretch by factor 2 parallel to the y-axis.
D. A translation of $\begin{pmatrix} 45 \\ 0 \end{pmatrix}$ then a stretch by factor 2 parallel to the y-axis. **[1]**

7. The graph of $y = \sqrt{-x}$ is the graph of $y = \sqrt{x}$ transformed by …

A. A translation of $\begin{pmatrix} -1 \\ 0 \end{pmatrix}$
B. A translation of $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$
C. A reflection in the x-axis
D. A reflection in the y-axis **[1]**

8. When the graph of $y = x^2 + 3x$ is tranlated by $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$, the resulting graph has equation …

A. $y = x^2 + 3x + 1$
B. $y = (x - 1)^2 + 3x$
C. $y = (x - 1)^2 + 3(x - 1)$
D. $y = (x + 1)^2 + 3x$ **[1]**

9. When the graph of $y = x^2 + 3x$ is reflected in the x-axis the resulting graph has equation …

A. $y = -(x^2 + 3x)$
B. $y = -x^2 - 3x$
C. $y = -x^2 + 3x$
D. B. $y = x^2 - 3x$ **[1]**

10. When the graph of $y = x^2 + 3x$ is reflected in the y-axis the resulting graph has equation …

B. $y = -(x^2 + 3x)$
B. $y = -x^2 - 3x$
C. $y = -x^2 + 3x$
D. B. $y = x^2 - 3x$ **[1]**

11.

Figure 1

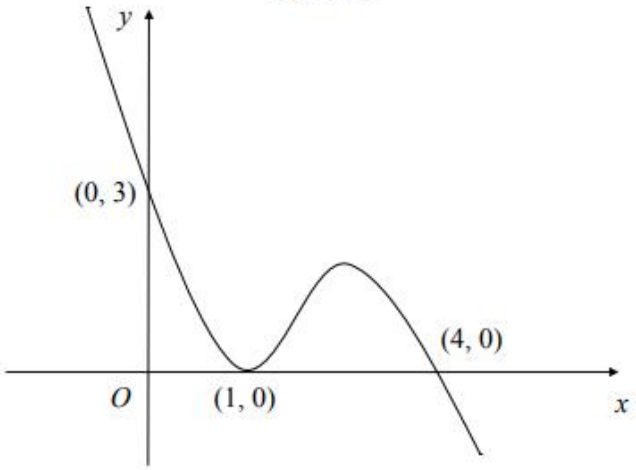


Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the points $(0, 3)$ and $(4, 0)$ and touches the x-axis at the point $(1, 0)$.

(a) Sketch the graph of $y = f(x + 1)$ showing clearly the coordinates of the points at which the curve meets the axes.

[2]

(b) Sketch the graph of $y = 2f(x)$ showing clearly the coordinates of the points at which the curve meets the axes.

[2]

(c) Sketch the graph of $y = f(\frac{1}{2}x)$ showing clearly the coordinates of the points at which the curve meets the axes.

[2]

12. The graph of $y = g(x)$ has its y-intercept at the point (0,6).
    What would be the coordinates of the y-intercept for $y = -g(x)$?

    y-intercept would be at (…… , ……) **[1]**

13. The graph of $y = h(x)$ has its y-intercept at the point (0,6).
    What would be the coordinates of the y-intercept for the curve with equation $2y = g(x)$?

    y-intercept would be at (…… , ……) **[1]**

14. The graph of $y = f(x + 3) + 4$ has a minimum point at (5,5).
    What would be the coordinates of the same minimum point for $y = f(x)$?

    Minimum point would be at (…… , ……) **[2]**

End of Topic Assessment Test – Coordinate Geometry [20 MARKS] /20

1. Find the equation of the perpendicular bisector of AB, where A is(-5,8) and B is (1,-4)

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2. Find the equation of the line parallel to $2x + 5y = 3$ that goes through (-1,2)

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[3]

3.

The straight line L_1 passes through the points $(-1, 3)$ and $(11, 12)$.

(a) Find an equation for L_1 in the form $ax + by + c = 0$,
where a, b and c are integers.

(3)

The line L_2 has equation $3y + 4x - 30 = 0$.

(b) Find the coordinates of the point of intersection of L_1 and L_2.

(2)

(Total 5 marks)

4.

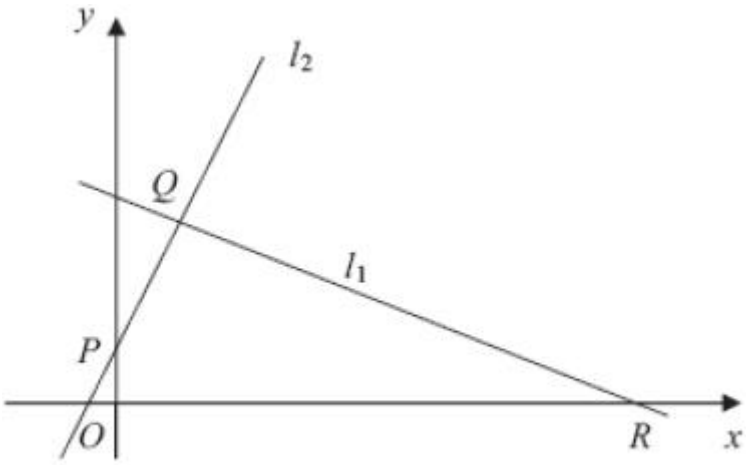

Figure 2

The points Q (1, 3) and R (7, 0) lie on the line l_1 , as shown in Figure 2.

The length of QR is $a\sqrt{5}$.

(a) Find the value of a.

(2)

The line l_2 is perpendicular to l_1 , passes through Q and crosses the y-axis at the point P, as shown in Figure 2. Find

(b) an equation for l_2,

(3)

(c) the coordinates of P,

(1)

(d) the area of ΔPQR.

(3)

(9 marks)

End of Topic Assessment Test – Quadratics [20 MARKS] /20

1) Solve by factorising

$$6x^2 - 13x - 5 = 0$$

[3 marks]

2) Solve by completing the square

$$x^2 - 6x - 2 = 0$$

[3 marks]

3) Solve by using the formula, giving answers in simplified surd form AND correct to 3 sf

$$3x^2 - 6x - 2 = 0$$

[3 marks]

4) Factorise then sketch the graph, indicating coordinates of the roots and the turning point

$$y = 2x^2 - 5x - 12$$

[4 marks]

5) Complete the square then sketch the graph

$$y = x^2 - 4x + 7$$

[3 marks]

6) Write in the form $y = a + b(x + c)^2$, where a,b,c are integers to be found, then sketch the graph, indicating the coordinates of the turning point

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

[4 marks]