SWCHS A Level Single and Further Maths Induction Work

Complete all the tasks on the following 3 pages.

There are notes and video links to help you if you need it. To make the video links work, you need to click on the links with the Powerpoint in presentation mode.

Your teacher will be taking in your work and marking it in the first two weeks of term.

If you have any issues, please contact smortimerbillings@swchs.net

Section 1 – Indices

Write each of these expressions in simplified index form.

a $x^3 \times x^7$

b $7x^5 \times 3x^6$

c $5x^4 \times 8x^7$

d $x^8 \div x^2$

e $8x^7 \div 2x^9$

f $3x^8 \div 12x^7$

g $(x^5)^7$

h $(x^2)^{-5}$

i $(3x^2)^4$

j $(6x^5)^2$

k $\sqrt{x^3}$

l $\sqrt[4]{x^5}$

m $\dfrac{5\sqrt{x}}{x}$

n $2x\sqrt{x}$

o $\dfrac{x^2}{3\sqrt{x}}$

p $x^3(x^5-1)$

q $x^3(\sqrt{x}+2)$

r $\dfrac{x+2}{x^3}$

s $\dfrac{\sqrt{x}+3}{x}$

t $\dfrac{(3-x^3)}{\sqrt{x}}$

u $(\sqrt{x}+3)^2$

v $\dfrac{3+\sqrt{x}}{x^2}$

w $\dfrac{1-x}{2\sqrt{x}}$

x $\dfrac{\sqrt{x}+2}{3x^3}$

Key point

$$x^a \times x^b = x^{a+b} \qquad x^a \div x^b = x^{a-b} \qquad (x^a)^b = x^{ab}$$

Key point

The nth root of x is written $\sqrt[n]{x} = x^{\frac{1}{n}}$, and this can be raised to a power to give $\sqrt[n]{x^m} = x^{\frac{m}{n}}$

Key point

A power of -1 indicates a reciprocal, so $x^{-1} = \dfrac{1}{x}$ and, in general, $x^{-n} = \dfrac{1}{x^n}$

Helpful Notes

Problem Solving Question

Find all the possible solutions of:

$$(x^2 - 7x + 11)^{(x^2-11x+30)} = 1.$$

SWCHS A Level Single and Further Maths Induction Work

Section 2 – Quadratics

Solve:

1. $x^2 - 6x + 3 = 0$
2. $x^2 - 5x - 6 = 0$
3. $x^2 + 4x - 12 = 0$
4. $x^2 - 7x = 3$
5. $\frac{2}{x} = \frac{x}{2}$
6. $6x^2 = 7x + 3$
7. $x^2 - 6x - 3 = 0$
8. $2x^2 - 12x = 1$
9. $x^2 + 5x = 5$
10. $x^2 = 7x - 10$
11. $(x + 3)^2 = 7 + 3x$
12. $x = \frac{12}{x} - 1$
13. $2(2x + 1)^2 = (3x - 2)^2$
14. $x - \frac{5}{x} = 2$

Helpful Video

Problem Solving – Hidden Quadratics

These are beyond the scope of the GCSE!

Remember to check your solutions in the original equation!

1. $x^4 - 8x^2 + 12 = 0$
2. $x - 4\sqrt{x} + 1 = 0$
3. $x^6 + 5x^3 = 24$
4. $x^2 - \frac{18}{x^2} = 7$ [clear fractions first…]
5. $9^x - 12 \times 3^x + 27 = 0$
6. $x^8 - 79x^4 = 162$
7. $3x^{\frac{2}{3}} = 5x^{\frac{1}{3}} + 2$
8. $9^{x+1} - 82 \times 3^x + 9 = 0$
9. $x - \sqrt{x} = 12$
10. $x - 10\sqrt{x + 2} + 24 = 0$

Section 3 – Linear Graphs

Here are the equations of 12 straight lines.

$y = 4x + 4$	$4y = x + 3$
$y = 8x - 3$	$y + 4x + 6 = 0$
$3y = 2x - 8$	$y + 6x = 11$
$y + 8x = 6$	$2y + 8 = 3x$
$2y + x = 4$	$2y = 8x + 3$
$y = 6x - 4$	$y + x + 8 = 0$

These 12 straight lines can be divided up into six pairs, each pair matching one of the following descriptions:

- These lines are parallel.

- These lines are perpendicular.

- These lines have the same y-intercept.

- These lines have the same x-intercept.

- These lines both go through the point $(1, 5)$.

- These lines …

Can you sort them into the correct pairs and complete the final description?

Parallel and Perpendicular Lines

x and y intercept

Is a point on a line?