كل ما يحتاجه الطالب في جميع الصفوف من أوراق عمل واختبارات ومذكرات، يجده هنا في الروابط التالية لأفضل مواقع تعليمي إماراتي 100 %

تطبيق المناهج الإماراتية	الاجتماعيات	الرياضيات
الصفحة الرسمية على التلغرام	الاسلامية	العلوم
الصفحة الرسمية على الفيسبوك	الانجليزية	
التربية الاخلاقية لجميع الصفوف	اللغة العربية	
التربية الرياضية		

مجموعات التلغرام.	مجموعات الفيسبوك	قنوات تلغرام	قنوات الفيسبوك
الصف الأول	الصف الأول	الصف الأول	الصف الأول
الصف الثاني	الصف الثاني	الصف الثاني	الصف الثاني
الصف الثالث	الصف الثالث	الصف الثالث	الصف الثالث
الصف الرابع	الصف الرابع	الصف الرابع	الصف الرابع
الصف الخامس	الصف الخامس	الصف الخامس	الصف الخامس
الصف السادس	الصف السادس	الصف السادس	الصف السادس
الصف السابع	الصف السابع	الصف السابع	الصف السابع
الصف الثامن	الصف الثامن	الصف الثامن	الصف الثامن
الصف التاسع عام	الصف التاسع عام	الصف التاسع عام	الصف التاسع عام
الصف التاسع متقدم	الصف التاسع متقدم	الصف التاسع متقدم	تاسع متقدم
الصف العاشر عام	الصف العاشر عام	الصف العاشر عام	عاشر عام
الصف العاشر متقدم	الصف العاشر متقدم	الصف العاشر متقدم	عاشر متقدم
الحادي عشر عام	الحادي عشر عام	الحادي عشر عام	حادي عشر عام
الحادي عشر متقدم	الحادي عشر متقدم	الحادي عشر متقدم	حادي عشر متقدم
ثاني عشر عام	الثاني عشر عام	الثاني عشر عام	الثاني عشر عام
ثاني عشر متقدم	الثاني عشر متقدم	ثاني عشر متقدم	ثاني عشر متقدم

Grade 9 Advanced Mathematics – Term 2 Revision Notes

Square of a Sum	$(a+b)^2 = a^2 + 2ab + b^2$ (a.k.a. as a perfect square)	
Square of a Difference	$(a-b)^2 = a^2 - 2ab + b^2$ (a.k.a. as a perfect square)	
Product of a Sum and a Difference	$(a+b)(a-b) = a^2 - b^2$ (a.k.a. as a difference of two squares)	Very useful for Factoring $x^2 - 9 = (x+3)(x-3)$ $9n^2 - 4 = (3n+2)(3n-2)$ $16c^2 - 49d^2 = (4c+7d)(4c-7d)$ $x^4 - 25 = (x^2+5)(x^2-5)$

Test for Perfect Square and Factoring

$$a^2 + 2ab + b^2 = (a+b)^2$$

$$a^2 - 2ab + b^2 = (a-b)^2$$

- The first and last terms must be perfect squares
- The middle term must be twice the product of the square roots of the first and last terms

$16x^2 + 24x + 9$

- $\sqrt{16x^2} = 4x$ and $\sqrt{9} = 3$ (both perfect squares)
- $2(4x)(3) = 24x$ (this is the middle term)
- So **this is a perfect square**
- We can factorise $16x^2 + 24x + 9 = (4x+3)^2$

$9x^2 - 12x + 4$

- $\sqrt{9x^2} = 3x$ and $\sqrt{4} = 2$ (both perfect squares)
- $-2(3x)(2) = -12x$ (this is the middle term)
- So **this is a perfect square**
- We can factorise $9x^2 - 12x + 4 = (3x-2)^2$

$25x^2 + 20x + 9$

- $\sqrt{25x^2} = 5x$ and $\sqrt{9} = 3$ (both perfect squares)
- $2(5x)(3) = 30x$ this is NOT the middle term **not a perfect square**

$4a^2 - 4a + 2$

- $\sqrt{2}$ is not a perfect square
- So $4a^2 - 4a + 2$ is **not a pefect square**

Factoring Polynomials by Grouping

Polynomials with four or more terms.

$$ax + bx + ay + by$$
$$= x(a+b) + y(a+b)$$
$$= (a+b)(x+y)$$

$4qr + 8r + 3q + 6$
$= (4qr + 8r) + (3q + 6)$ group terms with common factors
$= 4r(q+2) + 3(q+2)$ factor the GCF from each group
$= (q+2)(4r+3)$ distributive property

$2mk - 12m + 42 - 7k$
$= (2mk - 12m) + (42 - 7k)$ group terms with common factors
$= 2m(k-6) - 7(k-6)$ factor the GCF from each group
$= (k-6)(2m-7)$ distributive property

Factoring Trinomial Quadratic Expressions

(the more practise the easier this will become)

$x^2 + bx + c$

Find m and p with a product of c and a sum of b.
i.e. $m \cdot p = c$ and $m + p = b$
then re-write $x^2 + bx + c$ as $(x + m)(x + p)$

Example: $x^2 + 7x + 12$

b and c are **both +ve** so factors of 12 will be **+ve**

Factors of 12	Sum of Factors
$1, 12$	13
$2, 6$	8
$3, 4$	7

$(x + 3)(x + 4)$

Example: $x^2 - 22x + 21$

b is **-ve** and c is **+ve** so factors of 21 will be **-ve**

Factors of 21	Sum of Factors
$-1, -21$	-22
$-3, -7$	-10

$(x - 1)(x - 21)$

Example: $x^2 + 2x - 15$

c is **–ve** so factors of -15 have opposite signs (since b **is +ve** the greater absolute value factor is also **+ve**)

Factors of -15	Sum of Factors
$-1, +15$	14
$-3, +5$	2

$(x - 3)(x + 5)$

Example: $x^2 - 7x - 18$

c is **–ve** so factors of -18 have opposite signs (since b is **–ve** the greater absolute value factor is also **–ve**)

Factors of -18	Sum of Factors
$+1, -18$	-17
$+2, -9$	-7
$+3, -6$	-3

$(x + 2)(x - 9)$

$ax^2 + bx + c$

Find m and p with a product of ac and a sum of b.
i.e. $m \cdot p = ac$ and $m + p = b$
then re-write $ax^2 + bx + c$ as $ax^2 + mx + px + c$
finally factor by grouping.

Example: $2x^2 + 5x + 3$

$ac = 6$

Factors of ac	Sum of Factors
$1, 6$	7
$2, 3$	5

$2x^2 + 2x + 3x + 3$

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

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

Example: $3x^2 - 17x + 20$

$ac = 60$

Factors of ac	Sum of Factors
$-1, -60$	-61
$-2, -30$	-32
$-3, -20$	-23
$-4, -15$	-19
$-5, -12$	-17
$-6, -10$	-16

$3x^2 - 5x - 12x + 20$

$x(3x - 5) - 4(3x - 5)$

$(3x - 5)(x - 4)$

Example: $2x^2 + 3x - 5$

$ac = -10$

Factors of ac	Sum of Factors
$-1, +10$	9
$-2, +5$	3

$2x^2 - 2x + 5x - 5$

$2x(x - 1) + 5(x - 1)$

$(x - 1)(2x + 5)$

Example: $6x^2 - 7x - 3$

$ac = -18$

Factors of ac	Sum of Factors
$+1, -18$	-17
$+2, -9$	-7
$+3, -6$	-3

$6x^2 + 2x - 9x - 3$

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

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

Determine if a Polynomial is Prime

$4x^2 - 3x + 5$

$ac = 20$

Factors of ac	Sum of Factors
$-1, -20$	-21
$-2, -10$	-12
$-4, -5$	-9

There are no factors with a sum of -3. So the quadratic expression cannont be factored using integers. Therefore this is **prime**.

Zero Product Property

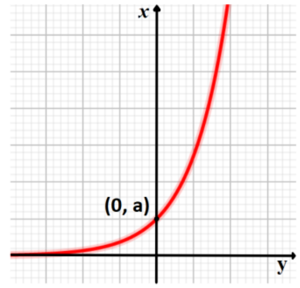
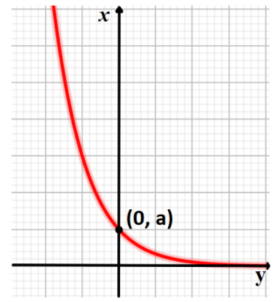
If the produce of two factors is 0, then at least one of the factors must be 0.
If $ab = 0$, then $a = 0$ or $b = 0$ or both a and b equal 0.

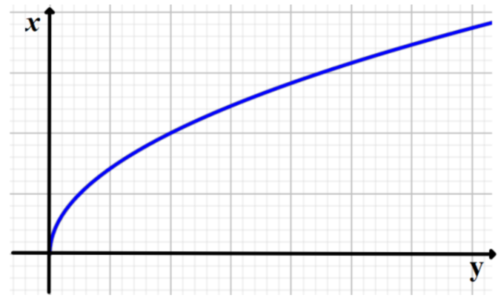
$(2d + 6)(3d - 15) = 0$

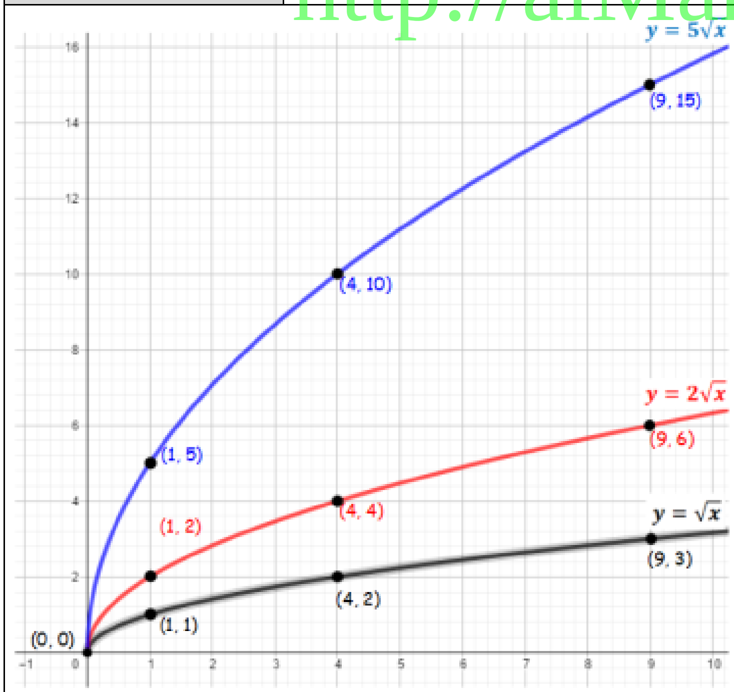
$2d + 6 = 0$ or $3d - 15 = 0$

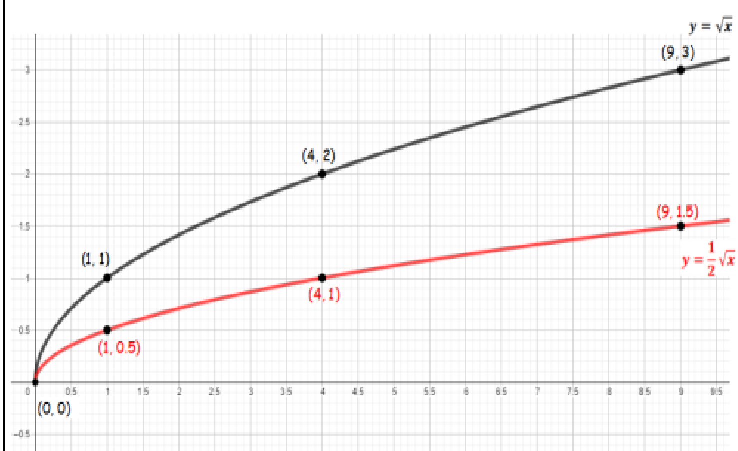
$2d = -6$ $\quad$ $3d = 15$

$d = -3$ $\quad$ $d = 5$

Graphing Exponential Growth	$y = ab^x$ $a > 0$ $b > 1$ **(a is the $y -$ intercept)**	
Graphing Exponential Decay	$y = ab^x$ $a > 0$ $0 < b < 1$ **(a is the $y -$ intercept)**	
Exponential Growth	$y = a(1 + r)^t$ $y =$ **final amount** $a =$ **initial amount** $r =$ **rate of change (decimal)** $t =$ **time**	
Exponential Decay	$y = a(1 - r)^t$ $y =$ **final amount** $a =$ **initial amount** $r =$ **rate of change (decimal)** $t =$ **time**	
Compound Interest	$A = P\left(1 + \frac{r}{n}\right)^{nt}$ $A =$ **current amount** $P =$ **principal amount (initial)** $r =$ **annual interest rate (decimal)** $n =$ **no. of times interest is compounded** $t =$ **time in years**	**compounded monthly** $n = 12$ **compounded quarterly** $n = 4$ **compounded daily** $n = 365$
Geometric Sequence	n^{th} **term** $a_n = a_1 r^{n-1}$ $a_1 =$ **first term** $r =$ **common ratio** (2nd term divide 1st term)	**Recursive Formula** $a_n = r \cdot a_{n-1}$ (Remember a_{n-1} is the previous term)

Arithmetic Sequence	**n^{th} term** $a_n = a_1 + (n-1)d$ a_1 = **first term** d = **common difference**	**Recursive Formula** $a_n = a_{n-1} + d$ (Remember a_{n-1} is the previous term)
Graphing Radical Function	$y = \sqrt{x}$ (remember the radicand can't be negative)	
Transformation of Radical Function 1 Dilation	$y = a\sqrt{x}$ $a > 1$ **Parent function:** $y = \sqrt{x}$ (stretched vertically)	$y = a\sqrt{x}$ $0 < a < 1$ **Parent function:** $y = \sqrt{x}$ (compressed vertically)





<table>
<tr><td>Transformation of Radical Function 2 Reflection</td><td>

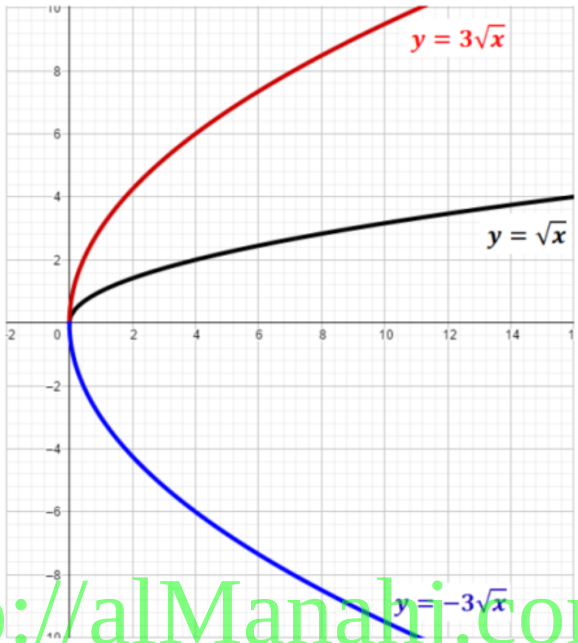
$$y = a\sqrt{x}$$

$$a < 0$$

Parent function: $y = \sqrt{x}$

(reflection across $x - axis$)

</td></tr>
<tr><td colspan="2">



</td></tr>
<tr><td>Transformation of Radical Function 3 Reflection</td><td>

$$y = \sqrt{x + h} + k$$

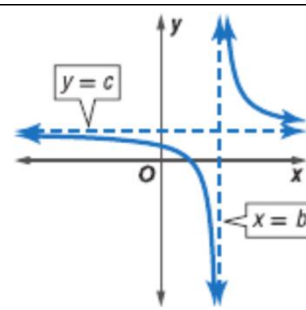
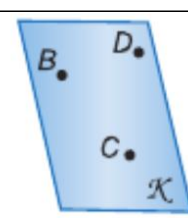
Translate the graph k units UP if $k > 0$ and $|k|$ units DOWN if $k < 0$

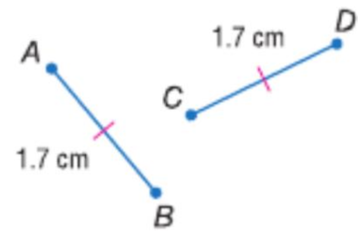
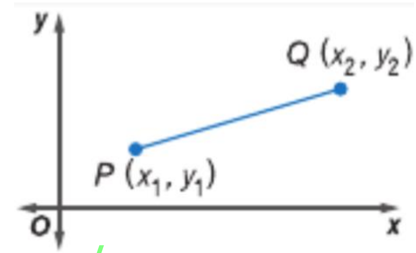
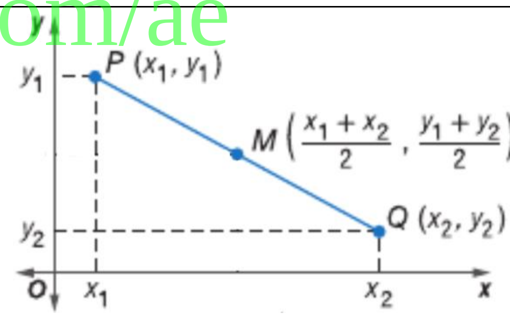
Translate the graph h units LEFT if $h > 0$ and $|h|$ units RIGHT if $h < 0$

Parent function: $y = \sqrt{x}$

</td></tr>
</table>

Simplifying a Square Root with Variables		
Variables with EVEN exponents in radicand and the simplified answer has an EVEN exponent	**Variables with EVEN exponents in radicand and the simplified answer has an ODD exponent** (must use ABSOLUTE VALUE symbol)	**Variables with ODD exponents in radicand**
$\sqrt{x^4} = x^2$	$\sqrt{x^2} = \lvert x \rvert$	$\sqrt{x^5} = \sqrt{x^4}\sqrt{x} = x^2\sqrt{x}$
$\sqrt{x^8} = x^4$	$\sqrt{x^6} = \lvert x^3 \rvert$	$\sqrt{x^{13}} = \sqrt{x^{12}}\sqrt{x} = x^6\sqrt{x}$
$\sqrt{x^{12}} = x^6$	$\sqrt{x^{22}} = \lvert x^{11} \rvert$	$\sqrt{x^{15}} = \sqrt{x^{14}}\sqrt{x} = \lvert x^7 \rvert\sqrt{x}$

Direct Variation	$y = kx$	k is known as the *constant of variation* or *constant of proportionality*
Inverse Variation	$xy = k$ $x \neq 0$ **and** $y \neq 0$	k is a non-zero constant
Product Rule for Inverse Variation	$x_1y_1 = x_2y_2$	If (x_1, y_1) and (x_2, y_2) are solutions of an inverse variation then the products $x_1\ y_1$ and $x_2\ y_2$ are equal.
Excluded Values for a Rational Function $\left(y = \frac{1}{x}\right)$	Division by zero is undefined. Any value that results in a denominator of zero is excluded from the domain of a rational function.	$y = \frac{5}{4x-8}$ $4x - 8 = 0$ $4x = 8$ $x = 2$ The excluded value is $x = 2$
Asymptotes	$y = \frac{a}{x-b} + c$ $a \neq 0$ vertical asymptote: $x = b$ horizontal asymptote: $y = c$	
Point	A point is a location. It has neither shape nor size. **point** A	
Line	There is exactly one line through any two points. **line** m**, line** PQ **or** $\overleftrightarrow{PQ}$**, line** QP **or** $\overleftrightarrow{QP}$	
Plane	There is exactly one plane through any three points that are not collinear. **plane** $\mathcal{K}$**, plane** BCD**, plane** BDC**, plane** CBD**, plane** CDB**, plane** DBC**, plane** DCB	

Collinear	Points that lie on the same line.	
Coplanar	Points that lie in the same plane.	
Segment	A line segment can be measured because it has two end points. **Label:** $\overline{AB}$ **or** $\overline{BA}$ **Measure:** AB **or** BA	
Congruent segments	Congruent segments have the same measure. ≅ **"is congruent to"** $\overline{AB} \cong \overline{CD}$ **which means** $AB = CD$	
Distance Formula	If P has coordinates (x_1, y_1) and Q has coordinates (x_2, y_2) then $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	
Midpoint Formula	If $\overline{PQ}$ has midpoints $P(x_1, y_1)$ and $Q(x_2, y_2)$ in the coordinate plane, then the midpoint M of $\overline{PQ}$ has coordinates $M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$	

Truth Tables

Negation

p	~p
T	F
F	T

"and"

Conjunction

p	q	p ∧ q
T	T	T
T	F	F
F	T	F
F	F	F

"or"

Disjunction

p	q	p ∨ q
T	T	T
T	F	T
F	T	T
F	F	F

<table>
<tr><td>Conditional Statement</td><td>$p \rightarrow q$

read as if p then q or p implies q

p is the hypothesis
q is the conclusion</td><td><table><tr><th colspan="3">Conditional Statements</th></tr><tr><th>p</th><th>q</th><th>$p \rightarrow q$</th></tr><tr><td>T</td><td>T</td><td>T</td></tr><tr><td>T</td><td>F</td><td>F</td></tr><tr><td>F</td><td>T</td><td>T</td></tr><tr><td>F</td><td>F</td><td>T</td></tr></table></td></tr>
<tr><td colspan="3">Related Conditionals</td></tr>
<tr><td>$p \rightarrow q$</td><td>Conditional</td><td rowspan="4">Logically Equivalent Statements
• A conditional and its contrapositive are logically equivalent
• The converse and inverse of a conditional are logically equivalent</td></tr>
<tr><td>$q \rightarrow p$</td><td>Converse</td></tr>
<tr><td>$\sim p \rightarrow \sim q$</td><td>Inverse</td></tr>
<tr><td>$\sim q \rightarrow \sim p$</td><td>Contrapositive</td></tr>
<tr><td>Inductive Reasoning</td><td colspan="2">Inductive reasoning uses patterns and observations to make a conjecture.</td></tr>
<tr><td>Deductive Reasoning</td><td colspan="2">Deductive reasoning uses facts, rules, definitions and properties to make a conjecture.</td></tr>
<tr><td>Law of Detachment</td><td>If $p \rightarrow q$ and p is true,

then q is true.</td><td rowspan="2">Helps us determine if a conclusion is valid or not.</td></tr>
<tr><td>Law of Syllogism</td><td>If $p \rightarrow q$ and $q \rightarrow r$ are true

then $p \rightarrow r$ is true.</td></tr>
</table>