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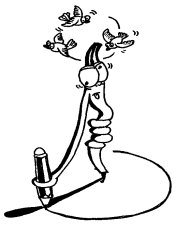
#2: FULL EXAM PAPERS



This book contains the following exam papers :

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GRADE 11 EXAM PAPERS

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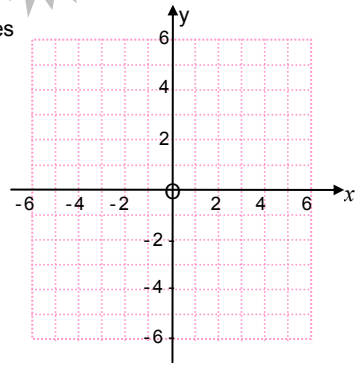
Trigonometry Summary

Mathematics Formula Sheet - National Department of Education

GRAPHS & FUNCTIONS

GRAPHS

1. On a separate set of axes (like the following), for each, draw graphs of:

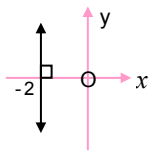


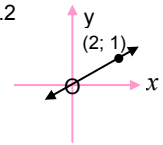
1.1 $y = 4 - x^2$ 1.2 $y = \frac{1}{x - 4}$ 1.3 $y = 4 - x$

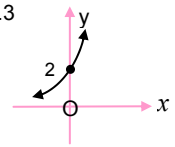
1.4 $y = -\frac{4}{x}$ 1.5 $y = \frac{x}{4}$ 1.6 $y = 4^x$

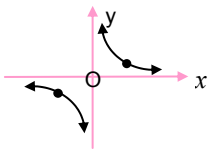
$(6 \times 3 = 18)$

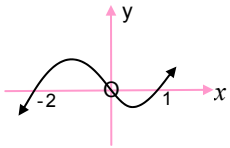
2. Five graphs named 2.1 → 2.5 are sketched below. They are followed by 10 equations. Match the graphs with the equations. Write down 2.1 → 2.5 and alongside these, the number selected from (1) to (10) that is the equation of the graph.

2.1 

2.2 

2.3 

2.4 

2.5 

List of possible equations

(1) $xy = 2$ (2) $xy = -2$

(3) $y = -2$ (4) $x = -2$

(5) $y = x(x + 1)(x - 2)$ (6) $y = x(x - 1)(x + 2)$

(7) $y = 2x$ (8) $y = \frac{x}{2}$

(9) $y = 2^{x+1}$ (10) $y = 2^{x-1}$ (10)

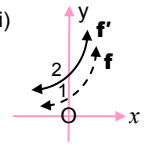
3.1 Given any function, $y = f(x)$ - line, hyperbola, parabola or exponential - describe the transformation required for the following images of f to occur:

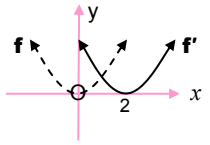
A $y = f(x) + 1$ B $y = f(x) - 2$ C $y = f(x + 1)$

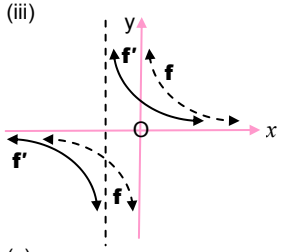
D $y = f(x - 2)$ E $y = f(-x)$ F $y = -f(x)$

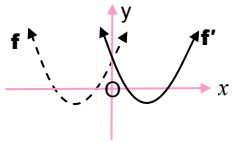
G $y = f(\theta - 20°)$ H $y = f(\theta + 20°)$ I $y = f^{-1}(x)$

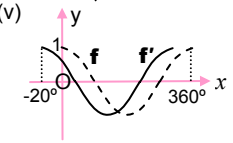
3.2 Match each of these sketches to A, B, C, . . . in 3.1.

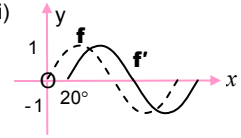
(i) 

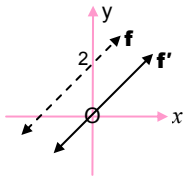
(ii) 

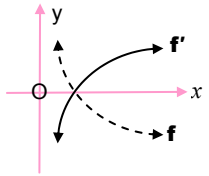
(iii) 

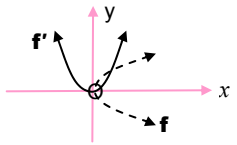
(iv) 

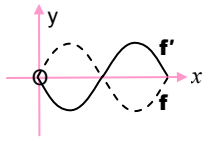
(v) 

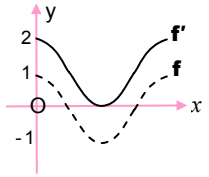
(vi) 

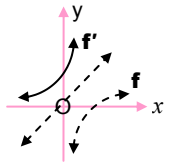
(vii) 

(viii) 

(ix) 

(x) 

(xi) 

(xii) 

4.1 If point P(1; 8) lies on the graph of the function $f(x) = 2^{x+a}$, find a.

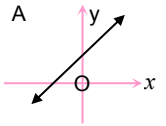
4.2 If the graph, **f**, is moved 2 units to the left and 5 units down, write down the equation of the graph in this new position.

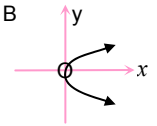
4.3 Write down the equation of the asymptote of the graph in Question 4.2.

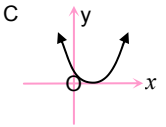
5.1 Determine the domain of the function $y = (x - 4)^{-1}$. (2)

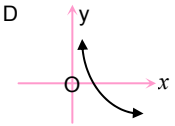
5.2 Write down the equations of the asymptotes of this function.

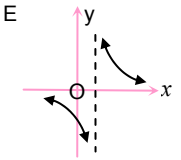
6.1 Which of the following graphs (if any) are not functions? Why?

A 

B 

C 

D 

E 

6.2 For which value(s) of x would the points P($2x$; $x + 6$) and Q($x + 5$; x) NOT lie on a function?

7. Given: $f(x) = x^2 - 4x - 5$, calculate the

7.1 x-intercepts of **f**. (3)

7.2 y-intercept of **f**. (1)

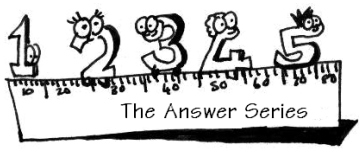
7.3 coordinates of the turning point. (5)

7.4 Draw a neat sketch graph of **f**, showing clearly all intercepts on the axes and the coordinates of the turning point. (5)

7.5 What is the largest value of c for which $x^2 - 4x - 5 \geq c$ for every value of x? (2)

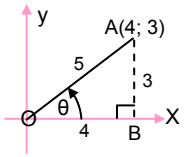
7.6 Use the graph to solve for x if $x^2 - 4x - 5 \geq 0$. (2)

7.7 Without any further calculations, sketch the graph of $y = -x^2 + 4x + 5$. (2)



90° Rule *(co-ratios!!!)*

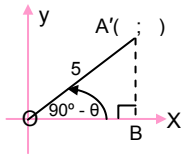
23.1 (a) Referring to Q22.1:
Express $O\hat{A}B$ in terms of θ.



(b) Write down the coordinates of A′ in the figure alongside.

(c) Write down the rule for the transformation of A to A′.

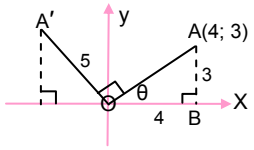
(d) Determine, first numerically, and then in terms of θ:



sin(90° - θ) = $\left(\frac{y}{r}=\right)$ .... = ...

cos(90° - θ) = $\left(\frac{x}{r}=\right)$ .... = ...

23.2 (a) Referring to Q22.1:
Rotate A through an angle of 90° about the origin, in an anti-clockwise direction, to A′ and write down the coordinates of A′.



(b) Express $B\hat{O}A'$ in terms of θ.

(c) Determine, first numerically, and then in terms of θ:

sin(90° + θ) = $\left(\frac{y}{r}=\right)$ .... = ... *(in terms of θ)*

cos(90° + θ) = $\left(\frac{x}{r}=\right)$ .... = ...

24. Express as ratios of acute L^S:

(a) sin 315° (b) cos 150° (c) tan 240°
(d) sin 390° (e) cos 480° (f) tan 405°
(g) tan(-120°) (h) sin(- 225°) (i) cos(- 300°) (9)

25. Simplify fully:

25.1 $\frac{\sin(180° - x) \cdot \cos(180° - x) \cdot \tan(180° + x)}{\sin(- x) \cdot \cos(360° - x)}$ (8)

25.2 $\frac{\sin(90° - \theta) \cdot \tan(180° - \theta)}{\cos(- \theta) \cdot \sin(180° + \theta)}$ (6)

25.3 $\frac{\sin(180° - x) \cdot \cos(90° - x)}{\cos(360° - x) \cdot \cos(90° + x)}$ (6)

25.4 $\frac{\cos(360° + \theta) \cdot \tan(360° - \theta)}{\sin(180° + \theta)} + \frac{\sin(90° + \theta)}{\cos(\theta - 360°)}$ (8)

26. If $x, y \in [0°; 90°]$, determine the values of x and y in each of the following equations.

26.1 $\cos 55° = \sin x$ 26.2 $\cos 140° = - \cos y$ (2)(2)

SOME EQUATIONS

($x \in [0°; 360°]$ only / no general solution / no compound $\angle^S$)

27.1 Solve for x without using a calculator, if $x \in [0°; 90°]$.

(a) $\sqrt{3} \tan x = 1$ (b) $\cos 2x = \frac{1}{2}$ (2)(2)

(b) $\sqrt{2} \sin(x - 10°) - 1 = 0$ (d) $\sin 2x = \frac{\sqrt{3}}{2}$ (3)(?)

27.2 Determine **ONE** value of θ in the interval [0°; 90°] satisfying the following equation. (You are not allowed to use a calculator and must show all your calculations.)

$\sqrt{2} \cos \theta = \tan 225°$ (4)

27.3 If $\sin(a + b) = \frac{\sqrt{3}}{2}$, $\cos(a - b) = \frac{1}{\sqrt{2}}$ and $a + b < 90°$, calculate the values of a and b. (5)

27.4 If $\tan(x + 10°) = \frac{1}{\sqrt{3}}$ and $x \in [180°; 360°]$ determine, without using a calculator, the value of x. (5)

28. Determine the value(s) of x in each of the following:

28.1 $\cos x = 0{,}364$ for $x \in [0°; 360°]$ (2)

28.2 $\sin 2x = - 0{,}61$ for $2x \in [0°; 360°]$ (4)

28.3 $2 \sin x - 0{,}71 = 0$, $x \in [0°; 360°]$ (3)

28.4 $\tan(x - 30°) = 1{,}57$; $x \in [0°; 360°]$ (4)

28.5 $5 \cos 2x = - 2{,}7$ and $x \in [0°; 180°]$ (4)

29. If $\sin^2 x = 0{,}646$, then $\cos^2 x = \ldots$

A. 1 B. $\sqrt{0{,}646}$ C. 1,646 D. 0,354 (2)

30. Solve for x, $x \in [0°; 90°]$: $\sin(5x - 12°) = \cos(4x + 30°)$

A. 42° B. 38° C. 18° D. 8° (2)

31. Solve for x without the use of a calculator:

31.1 $\sin x = \cos 21°$ if $0° < x < 90°$ (3)

31.2 $1 - \sin^2 x = \frac{1}{4}$ if $x \in [0°; 360°]$ (5)

32. Determine x if $2 \sin x - \frac{1}{\sin x} = 0$. (5)

33. What is wrong with the statement $\sin x = 1{,}2$? (1)

MORE IDENTITIES

(GRADE 11 & 12)

(no compound angles)

$\frac{\sin \theta}{\cos \theta} = \tan \theta$ $\sin^2\theta + \cos^2\theta = 1$

Simplify:

1.1 $\sin x . \tan x . \cos x$ 1.2 $\tan x . \sin^2 x + \tan x . \cos^2 x$ (2)(2)

1.3 $\frac{\sin^2 x \cos x + \cos^3 x}{\cos x}$ 1.4 $\frac{(\sin x + \cos x)^2}{\sin^2 x - \cos^2 x}$ (2)(2)

2.1 *Complete*: $1 - \sin^2 x = \ldots\ldots$ (1)

2.2 *Simplify*: $\frac{1 - \sin^2 x}{\cos x}$ (2)

2.3 *Prove*: $\frac{\sin x \, . \cos x}{1 + \cos^2 x - \sin^2 x} = \frac{1}{2} \tan x$ (4)

Prove the following identities:

3.1 $(\sin x + \cos x)^2 = 1 + 2 \sin x \cos x$ (2)

3.2 $\sin^4\theta - \cos^4\theta = 1 - 2 \cos^2\theta$ (2)

3.3 $\frac{\cos x + \tan x . \sin x}{\frac{1}{\cos x}} = 1$ (4)

3.4 $\sin x + \frac{\cos^2 x}{\sin x} = \frac{1}{\sin x}$ (5)

Simplify:

4.1 $\frac{\tan^2 \beta}{\tan^2 \beta + 1}$ 4.2 $\frac{\sin^2 x \, . \cos x}{1 - \cos^2 x}$ (5)(2)

4.3 $\sqrt{(1 - \cos x)(1 + \cos x)}$ if $0° < x < 90°$ (3)

Simplify:

5.1 $\sin(180° + \theta) . \sin(360° - \theta) - \cos(180° - \theta) . \cos(- \theta)$ (5)

5.2 $\frac{\sin(90° + \theta) . \cos(90° - \theta) . (\sin^2 \theta + \cos^2 \theta)}{\tan(180° - \theta) . \cos(360° - \theta)}$ (6)

Prove:

6.1 $\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} = \frac{1}{\sin \theta \cos \theta}$ (2)

6.2 $\frac{(\sin \theta + \cos \theta)^2}{\cos \theta} = \frac{1}{\cos \theta} + 2 \sin \theta$ (4)

6.3 $\frac{1}{1 - \sin \theta} + \frac{1}{1 + \sin \theta} = \frac{2}{\cos^2 \theta}$ (4)