

**GRADE 11 MATHEMATICS
NOVEMBER EXAMINATION PAPER 2**

QUESTION 1

1.1 Calculate the following with the use of a calculator:

1.1.1 $\sin 42^\circ + \cos 42^\circ$ (1)

1.1.2 $\tan^2 50^\circ$ (1)

1.1.3 $\cot 32^\circ + \operatorname{cosec} 15^\circ$ (1)

1.2 If $A = 34,3^\circ$ and $B = 22,2^\circ$, calculate the following to two decimal places:

1.2.1 $\sin (A + B)$ (2)

1.2.2 $\sec \left(\frac{A}{2}\right)$ (2)

1.3 Calculate the following without the use of a calculator:

1.3.1 $\sin 30^\circ + \cos 60^\circ$ (1)

1.3.2 $\tan 45^\circ + \cos 45^\circ$ (1)

1.3.3 $\cos 90^\circ + \sin 90^\circ$ (1)

[12]

QUESTION 2

Without the use of a calculator, answer the following questions:

2.1 Given $\cos \theta = -\frac{1}{2}$ and $0^\circ \leq \theta \leq 180^\circ$
Use a diagram to determine the values of:

2.1.1 $\tan (180^\circ + \theta)$ (1)

2.1.2 $3\sin (\theta - 90^\circ)$ (2)

2.2 Simplify the following expression: $\frac{\sin(-230^\circ)}{\cos(240^\circ)} + \frac{\cos(190^\circ)}{\sin(260^\circ + 40^\circ)}$ (5)

2.3 Prove that: $\tan \theta \sqrt{\frac{1}{\sin^2 \theta} - 1} = 1$ (4)

2.4 Determine the general solution for: $3\sin^2 \theta + 1 = \sin \theta$ (6)

[28]

QUESTION 3

3.1 Sketch on the same set of axes the graphs for:

$f(x) = -2\cos x$ and $g(x) = \sin 2x$, for the interval $-90^\circ \leq x \leq 180^\circ$.

Show the coordinates of the turning points and all axis intercepts. (5)

3.2 Study the following sketch and determine the value of $\cos \theta - \cos \phi$, without the use of a calculator.



(5)
[10]

QUESTION 4

In the diagram below, the angle between line AB and the x-axis is β . The angle between line CD and the x-axis is θ . A and D are the x-axis intercept points for lines AB and CD respectively. The coordinates of point B are $(\sqrt{3}, 2)$.

The intercept point E, of lines AB and CD lies on the y-axis. $\angle EDC = 63,69^\circ$

The equation of the line CD is given as: $3x + 2y = 6$



4.1 Determine the coordinates of E. (2)

4.2 Calculate the numerical value of α . (2)

4.3 Calculate the numerical value of β . (2)

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M Tight



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Engineering Optimization R. Russell Rhinehart, 2018-05-29 An Application Oriented Introduction to Essential Optimization Concepts and Best Practices Optimization is an inherent human tendency that gained new life after the advent of calculus now as the world grows increasingly reliant on complex systems optimization has become both more important and more challenging than ever before Engineering Optimization provides a practically focused introduction to modern engineering optimization best practices covering fundamental analytical and numerical techniques throughout each stage of the optimization process Although essential algorithms are explained in detail the focus lies more in the human function how to create an appropriate objective function choose decision variables identify and incorporate constraints define convergence and other critical issues that define the success or failure of an optimization project Examples exercises and homework throughout reinforce the author's do not study approach to learning underscoring the application oriented discussion that provides a deep generic understanding of the optimization process that can be applied to any field Providing excellent reference for students or professionals Engineering Optimization Describes and develops a variety of algorithms including gradient based such as Newton's and Levenberg Marquardt direct search such as Hooke Jeeves Leapfrogging and Particle Swarm along with surrogate functions for surface characterization Provides guidance on optimizer choice by application and explains how to determine appropriate optimizer parameter values Details current best practices for critical stages of specifying an optimization procedure including decision variables defining constraints and relationship modeling Provides access to software and Visual Basic macros for Excel on the companion website along with solutions to examples presented in the book Clear explanations explicit equation derivations and practical examples make this book ideal for use as part of a class or self study assuming a basic understanding of statistics calculus computer programming and engineering models Anyone seeking best practices for making the best choices will find value in this introductory resource **PISA 2015**

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