PERTH MODERN SCHOOL
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Independent Public School

Course _____Specialist_____ Year __12_____

Student name: _____ Teacher name: _____

Date: 21 Aug Fri

Task type: **Response**

Time allowed for this task: **_____45_____ mins**

Number of questions: **_____6_____**

Materials required: **NO CLASSPADS/CALS**

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: Drawing instruments, templates, , and up to three calculators approved for use in the WACE examinations

NO NOTES ALLOWED

Marks available: **__39____ marks**

Task weighting: **_12___%**

Formula sheet provided: **Yes**

Note: All part questions worth more than 2 marks require working to obtain full marks.

Q1 (4.1.2) **(3, 3 & 3 = 9 marks)**

Determine the following integrals showing full working.

a) $\int \frac{5x}{\sqrt{7x^2 - 3}} dx \quad u = 7x^2 - 3$

b) $\int (3x + 2)(5x - 1)^7 dx \quad u = 5x - 1$

c) $\int \frac{\sqrt{x}}{\sqrt{x} + 7} dx$

Q2 (4.1.1 -4.1.3) **(3, 3 & 3 = 9 marks)**

Determine the following definite integrals showing full working.

a) $\int_0^{\frac{\pi}{6}} \cos^2 4x \, dx$

b) $\int_0^{\pi} \sin^3 2x \, dx$

c) $\int_0^{\frac{\pi}{4}} -12 \tan^2 5x \, dx$

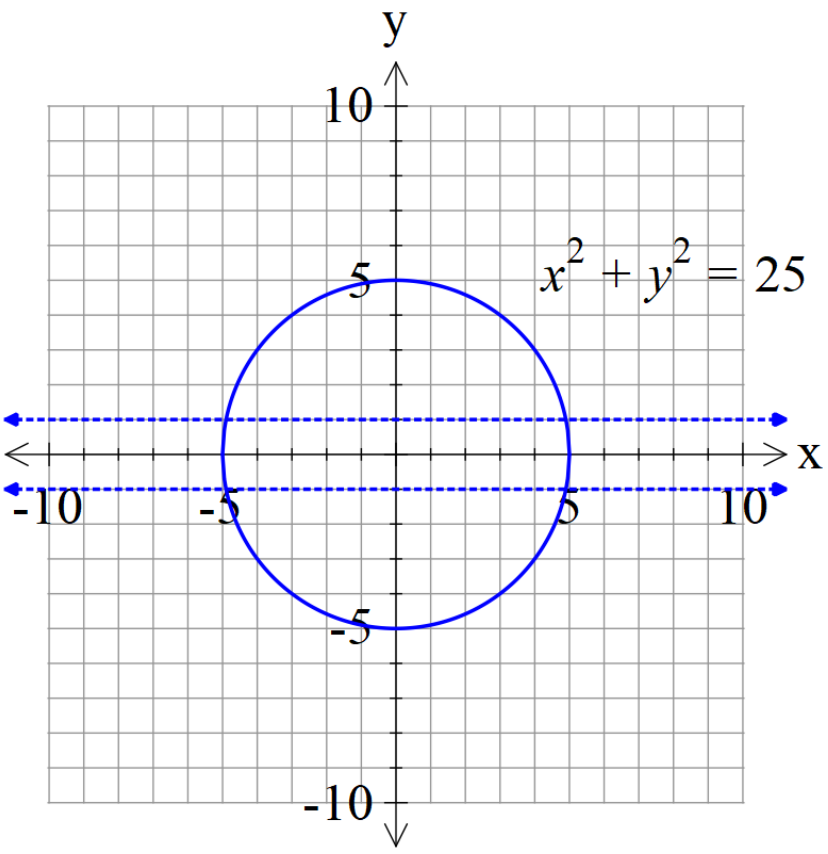
Q3 **(4 marks)**

Determine the following integral showing full working.

$$\int \frac{x+7}{(x+1)(x-3)^2}\,dx$$

Q4 (4.1.5-4.1.6) (5 marks)

Consider a cylindrical drill of width 2 cm that carves a cavity inside a solid sphere of radius 5 cm as shown below. Determine the volume of the sphere remaining.(Simplify)



Q5 (4.2.4) **(4 marks)**

Determine the solution to the following differential equation $yx^2\frac{dy}{dx}=\frac{x+x^3}{(5y^2+1)^4}$ given that (1,1) is a known point.(No need to simplify)

Q6 (4.2.6) **(1, 5 & 2 = 8 marks)**

Consider the differential equation $\frac{dN}{dt}=aN-bN^2$ with $a\,\&\,b$ positive constants.

a) Determine the limiting value for N as $t\to\infty$

b) Show how to derive using integration and partial fractions that the general solution is $N=\frac{a}{b+Ce^{-at}}$

a) Consider $\frac{dN}{dt} = 5N - 3N^2$ with an initial value of $N = 1$. Determine N when t=50.
(No need to simplify)

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