UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

DEPARTMENT OF APPLIED PHYSICS AND ENGINEERING MATHEMATICS

MODULE: WWEA22C MATHEMATICS II
(NATIONAL DIPLOMA, ENGINEERING: CIVIL

CAMPUS: DFC
SUPPLEMENTARY EXAM: NOVEMBER 2015

DATE: NOVEMBER 2015
EXAMINER **Mr JJ Bruyns**
MODERATOR **Mr C Lock**

DURATION 90 minutes **MARKS 60**

NUMBER OF PAGES: 4 PAGES

INSTRUCTIONS:

- **ONE NON PROGRAMMABLE CALCULATOR IS PERMITTED.**
- **REQUIREMENTS: MATHEMATICAL INFORMATION BOOKLET**

Section A

1. $\int_1^2 \frac{\ln x}{x} dx$ (2)

2. $\int \frac{0{,}5^{\sin^{-1} x}}{\sqrt{1-x^2}} dx$ (2)

3. Find the area under the curve $y = \sqrt{x}$ between $x = 0$ and $x = 4$ (2)

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Section B

4. Determine the integrals below, show all steps:

4.1 $\int \cos^3 2x\, dx$ (3)

4.2 $\int \frac{x^2 - 3x + 4}{x^3 - 2x^2 + x} dx$ (6)

4.3 $\int \frac{2}{\sqrt{3 + 2x - x^2}} dx$ (5)

4.4 $\int 2x^2 \ln x dx$ (5)

4.5 $\int \sec^2 x\, dx$ (3)

4.6 $\int \frac{x^2 - 2x}{(2x+1)(x^2+1)} dx$ (5)

4.7 $\int_0^\infty e^{2x} \sin x dx$ (5)

4.8 $\int \frac{2x + 3}{9x^2 - 12x + 8} dx$ (5)

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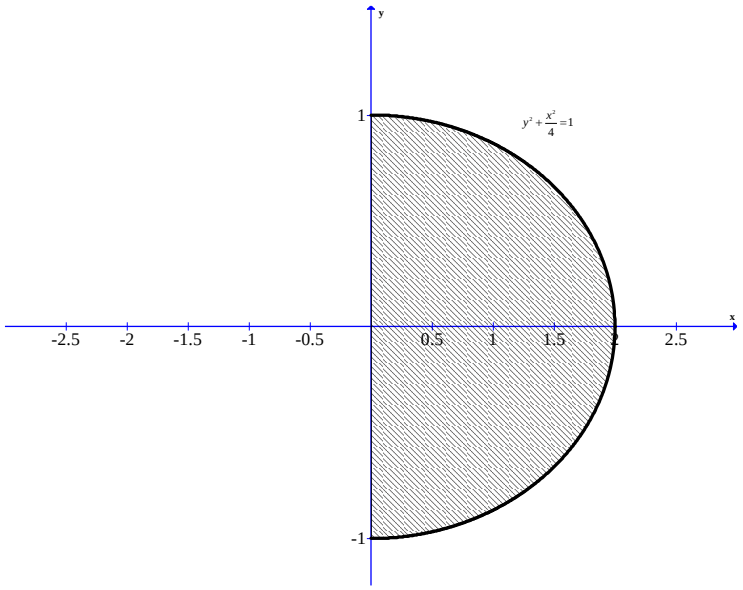
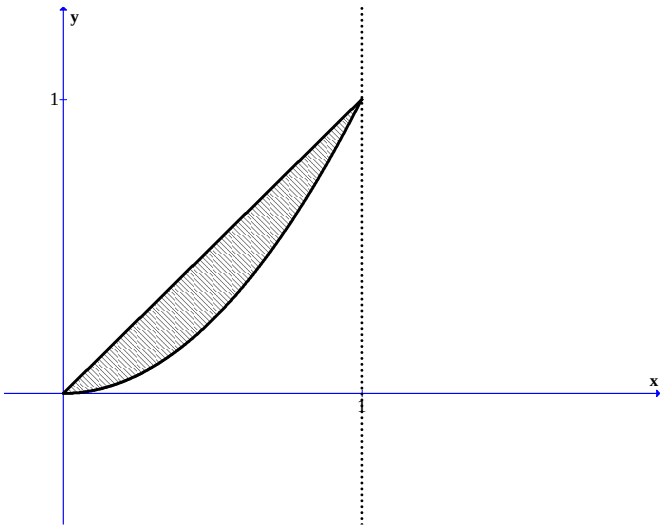
5.1 An airplane's fuel tank is an oblate ellipsoid generated by revolving the region bounded by first and fourth quadrant of the ellipse $\frac{x^2}{4} + y^2 = 1$ about the ***y-axis***. Calculate the volume of the fuel tank. (5)

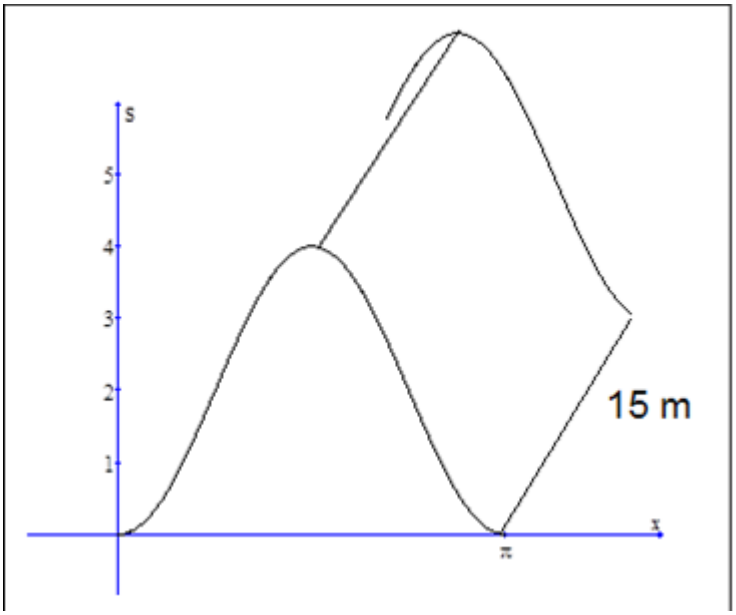


5.2.1 Determine the **area** bounded between the two graphs the parabola $y = x^2$ and the line $y = x$ (3)

5.2.2 Determine the **volume** of the solid of revolution generated when the area bounded by the parabola $y = x^2$ and the line $y = x$ is revolved about the line x=1 (5)



5.3 The shape of a mine dump is defined by $S = 4\sin^2 x$. If the mine dump has a uniform width of 15 meters and a width of π meters , and the sand must be transported by trucks with a capacity of $20m^3$, determine the volume of the sand and calculate the number of truckloads required to move the sand to a new location. NB This is not a rotation. (5)



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Total: 63