



**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED MATHEMATICS**

**MODULE: MATHEMATICS FOR FINANCE AND BUSINESS 1B – MATDCB1**  
**CAMPUS: SWC**  
**ASSESSMENT: EXAM**

**DATE: 31 OCTOBER 2015**

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**DURATION: 2 HOURS**

<b>60</b>

**INITIALS AND SURNAME:** \_\_\_\_\_

**STUDENT NUMBER:** \_\_\_\_\_

**CONTACT NUMBER:** \_\_\_\_\_

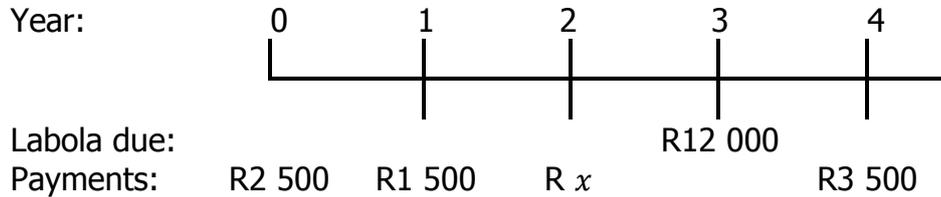
**NUMBER OF PAGES: 13 (INCLUDING COVER PAGE AND ANNEXURE A)**

**INSTRUCTIONS:**

- ANSWER ALL THE QUESTIONS IN PEN
- NO REMARK ON PENCIL, NO TIPEX ALLOWED
- ALL GRAPHS MUST BE DRAWN IN PEN
- STATE ALL FORMULAS USED, MARKS ARE GIVEN TO FORMULAS
- SHOW ALL THE NECESSARY CALCULATIONS
- IF NECESSARY ROUND OFF TO TWO DECIMAL PLACES
- SCIENTIFIC CALCULATORS ARE ALLOWED
- QUESTIONS CAN BE ANSWERED IN ANY ORDER

**Question 1****[6]**

Sipho wants to marry Mubedi but her father insists that he must first pay R12 000 labola. Sipho negotiates with the father to pay the labola over a few years as he is still searching for a decent job. They agree to the following payments:



If money is worth 8% compounded quarterly, determine the value of  $x$ .

**Question 2****[12]**

A borrower is repaying a R750 000 loan at 9.5% per year, compounded monthly, with monthly payments over 20 years.

- 2.1 Determine the monthly payment. (3)
- 2.2 Determine the balance outstanding after the 70<sup>th</sup> payment. (3)
- 2.3 Determine the interest contained in the 20<sup>th</sup> payment. (3)
- 2.4 Determine the finance charge. (3)

**Question 3****[5]**

Let  $x$  be the number of litres of regular petrol and  $y$  the number of litres of premium petrol. Given the following constraints:

$$\begin{aligned} 3x + 5y &\leq 120 \\ 6x + 4y &\leq 180 \\ x &\geq 0, y \geq 0 \end{aligned}$$

and the objective function:  $P = 80x + 120y$

- 3.1 Graph the feasible region. (3)
- 3.2 Determine the value of  $x$  and  $y$  such that  $P$  is a maximum. Hence, give the maximum value of  $P$ . (2)

**Question 4****[5]**

For the following equation:

$$2x + 4y^3 = 16$$

4.1 Determine  $\frac{dy}{dx}$  by first making  $y$  the subject of the equation. (3)4.2 Determine  $\frac{dx}{dy}$  by first making  $x$  the subject of the equation. (2)**Question 5****[7]**Differentiate each of the following functions with respect to  $x$ . You do not need to simplify your solution.5.1  $f(x) = x^3 + 7x^{-2} + 18 - \sqrt{x}$  (2)5.2  $g(x) = e^{2x^3+2x-6}$  (2)5.3  $h(x) = \frac{4x^2+3x-9}{1-x^3}$  (3)**Question 6****[4]**Determine the equation of the tangent line at the point  $x = 1$  on the curve:

$$f(x) = 6x^2 - 2x^3$$

**Question 7****[2]**

Determine the first and second derivative of the following function:

$$y = \ln(x) - e^{4x}$$

**Question 8****[5]**

Given the following data set regarding the profit made from each project in a company:

30 000	16 000	21 000	30 000	11 000	18 000
18 000	10 000	21 000	23 000	16 000	15 000
12 000	29 000	16 000	40 000	42 000	24 000

8.1 Complete the following table. (3)

Class	Count	Frequency	Relative Frequency
[10 000;15 000]			
[16 000;20 000]			
[21 000;25 000]			
[26 000;30 000]			
[31 000;35 000]			
[36 000;40 000]			
[41 000;45 000]			
	<b>Total</b>		

8.2 Draw now a histogram (bar chart) to graphically represent the data. (2)

**Question 9** [2]

Let  $S$  be the sample space of a die, and define the following three events on  $S$ :

$$A = \{\text{even numbers}\} \quad B = \{\text{odd numbers}\} \quad C = \{3,6\}$$

Draw a Venn diagram to illustrate  $S$ ,  $A$ ,  $B$  and  $C$ .

**Question 10** [2]

10.1 Give your own example of two mutually exclusive events. (1)

10.2 Give your own example of two independent events. (1)

**Question 11** [6]

A bag contains 5 red balls and 3 blue balls. Two balls are drawn, first the one and then the other, without replacement.

11.1 Draw a complete tree diagram indicating all the possibilities and probabilities. (3)

11.2 What is the probability of drawing two of the same coloured balls? (2)

11.3 What is the probability of drawing not two of the same coloured balls? (1)

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**Question 12** (Round off to 4 decimal places here)**[4]**

Using Annexure A, determine:

$$P(-2 < X < 6)$$

If  $X$  has  $\mu = 3$  and  $\sigma = 4$ .

<b>End of Assessment – Total Marks: 60</b>
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**ANNEXURE A**

	<b>0.00</b>	<b>0.01</b>	<b>0.02</b>	<b>0.03</b>	<b>0.04</b>	<b>0.05</b>	<b>0.06</b>	<b>0.07</b>	<b>0.08</b>	<b>0.09</b>
<b>0.0</b>	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
<b>0.1</b>	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
<b>0.2</b>	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
<b>0.3</b>	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
<b>0.4</b>	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
<b>0.5</b>	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
<b>0.6</b>	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
<b>0.7</b>	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
<b>0.8</b>	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
<b>0.9</b>	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
<b>1.0</b>	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
<b>1.1</b>	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
<b>1.2</b>	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
<b>1.3</b>	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
<b>1.4</b>	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
<b>1.5</b>	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
<b>1.6</b>	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
<b>1.7</b>	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
<b>1.8</b>	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
<b>1.9</b>	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
<b>2.0</b>	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
<b>2.1</b>	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
<b>2.2</b>	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
<b>2.3</b>	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
<b>2.4</b>	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
<b>2.5</b>	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
<b>2.6</b>	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
<b>2.7</b>	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
<b>2.8</b>	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
<b>2.9</b>	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
<b>3.0</b>	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990