

UNIVERSITY OF JAFFNA, SRI LANKA
BACHELOR OF PHARMACY SECOND YEAR FIRST SEMESTER
EXAMINATION - SEPTEMBER 2018
PHAMM 2111- PHARMACEUTICAL MATHEMATICS

Date: 18.09.2018

Time: 01 Hour

Answer All Questions

1. (a) Examine the nature of roots in each of the following quadratic equations and also verify them by quadratic formula.

i. $9y^2 - 6\sqrt{2}y + 2 = 0$;

ii. $\sqrt{2}t^2 - 3t + 3\sqrt{2} = 0$.

- (b) Show that the roots of the quadratic equation

$$2(a^2 + b^2)x^2 + 2(a + b)x + 1 = 0$$

are imaginary, when $a \neq b$.

- (c) Use the laws of logarithms to combine each of the following expression as a single logarithm.

i. $\frac{1}{3} \log_a x^2 + \log_a \sqrt{x + y^2} - \log_a (x^2 + a)$;

ii. $\frac{\ln(x^3 + 1)}{\ln 2} - \log_2(x^3 + 1)$;

iii. $4[\ln z + \ln(z + 5)] - 2 \ln(z - 5)$.

- (d) Solve the following equations in the domain $0 \leq x < 2\pi$.

i. $2 \sin x \cos x = \sqrt{2} \cos x$;

ii. $4 \sin x \cos x - 2\sqrt{3} \sin x - 2\sqrt{2} \cos x + \sqrt{6} = 0$;

iii. $\sec x - \sqrt{2} = 0$.

2. (a) Find the following limits:

i. $\lim_{x \rightarrow 0} \frac{(x+2)^{\frac{1}{3}} - 2^{\frac{1}{3}}}{x}$;

ii. $\lim_{x \rightarrow 0} \frac{\sqrt{2} - \sqrt{1 + \cos x}}{\sin^2 x}$;

iii. $\lim_{x \rightarrow \infty} \frac{3x\sqrt{x} + 3x + 1}{x^2 - x + 11}$;

iv. $\lim_{x \rightarrow -6} \frac{\frac{2x+18}{x^2-12} - \frac{1}{x}}{x+6}$.

(b) Differentiate the following with respect to x , simplifying your answer where possible:

i. $(x^8 + 2x + 3)e^x$;

ii. $\frac{(x^2 - 1)(2 \cos 3x)}{\ln x}$;

iii. $\frac{4}{\sqrt{\sec^2 x + \tan^2 x}}$;

iv. $\frac{x^2 - 3x + 1}{x + 2}$.

(c) By making a suitable substitution, find each of the following integrals:

i. $\int_0^5 x^3 \sqrt{x^4 + 1} dx$;

ii. $\int \frac{3}{x[\ln x]^2} dx$;

iii. $\int \frac{e^x}{(e^x + 2)^3} dx$;

iv. $\int_0^{\pi^2} \frac{\sin \sqrt{x}}{\sqrt{x}} dx$.

End of Exam