

UNIVERSITY OF JAFFNA, SRI LANKA
BACHELOR OF PHARMACY
SECOND YEAR FIRST SEMESTER EXAMINATION, OCT-2019
PHAMM 2111-PHARMACEUTICAL MATHEMATICS

Date : 29.10.2019

Time: One hour

Answer All Questions

1. (a) i. Show that the roots of the equation $x^2 + (mx + c)^2 = a^2$ are equal if $c^2 = a^2(1 + m^2)$.
ii. Prove that if α and β are roots of the equation $x^2 - px - p - c = 0$ then $(1 + \alpha)(1 + \beta) = 1 - c$.

(b) Prove that

- i. $\log(ab^2) - \log(ac) + \log(bc^4) - 3\log(bc) = 0$;
ii. $\log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ca}\right) + \log\left(\frac{c^2}{ab}\right) = 0$;
iii. if $\log(x + y) = \log x - \log y$ then $x(1 - y) = y^2$.

(c) Prove that

- i. $\sqrt{\frac{1 - \sin \theta}{1 + \sin \theta}} = \sec \theta - \tan \theta$;
ii. $\frac{\sin \theta + \cos \theta}{\tan^2 \theta - 1} = \frac{\cos^2 \theta}{\sin \theta - \cos \theta}$;
iii. if $m = \tan \theta + \sin \theta$ and $n = \tan \theta - \sin \theta$ then $m^2 - n^2 = 4\sqrt{mn}$.

(d) Find the values of $\sin \theta$, $\cos \theta$ and $\tan \theta$, when

- i. $\theta = -180^\circ$;
ii. $\theta = \frac{11\pi}{3}$;
iii. $\theta = 450^\circ$.

2. (a) Differentiate the following with respect to x :

i. $y = e^{3x} \tan x$;

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

iii. $y = \sqrt{x}(2x - 1)(x^3 - x)$;

iv. $y = \frac{\sin 3x}{4 + 5 \cos 2x}$.

(b) Prove that if $y = 3 \cos x + \sin x$, then

i. $\cos x \left(\frac{dy}{dx} \right) + y \sin x - 1 = 0$;

ii. $\frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + 2y - 10 \sin x = 0$.

(c) Find the relative extrema of the function $f(x) = x^3 + 3x^2 - 9x - 13$ and classify them.

(d) Find the following integrals:

i. $\int \left(\frac{1}{3x} - \frac{3}{2x^2} + e^2 + \frac{\sqrt{x}}{2} \right) dx$;

ii. $\int x(2x + 1)^2 dx$;

iii. $\int \sin^2 x dx$;

iv. $\int \frac{2x \ln(x^2 + 1)}{x^2 + 1} dx$, you may use the substitution $t = x^2 + 1$.

End of Exam.