University of Jaffna, Sri Lanka
Faculty of Allied Health Sciences
Bachelor of Pharmacy
Second Year First Semester Examination-2019
PHAPM2111-Pharmaceutical Mathematics

Date : **06.12.2021** Time: **One hour**

Answer All Questions

1. (a) i. Find the nature of the roots of the following quadratic equations:
   - $3x^2 + 7x - 2 = 0$;
   - $\sqrt{2}y^2 + 3y - \sqrt{8} = 0$.

   ii. Show that the roots of the equation $(mx + c)^2 = 4ax$ will be equal if $c = \dfrac{a}{m}$.

   (b) Use the logarithm laws to write each of the following expression as a single logarithm:

   i. $\log_5 x - 2$;

   ii. $\dfrac{1}{2}\log_2 u + \dfrac{1}{3}\log_2 y - \dfrac{1}{2}[\log_2 a + \log_2 b]$;

   iii. $2\ln(w - 5) - \dfrac{1}{2}[\ln(x + y) - \ln(x - y)]$.

   (c) i. Prove that $\dfrac{1 - 2\sin^2\theta}{\sin\theta\cos\theta} = \tan\theta - \cot\theta$;

   ii. Suppose that $a\cos\theta = b$ and $c\sin\theta = d$, for some angle θ and some constants a, b, c and d. Show that $a^2c^2 = b^2c^2 + a^2d^2$.

   (d) Find the numerical value of

   i. $\cos 105°$;

   ii. $\tan\dfrac{7\pi}{12}$.

Continued

2. (a) Differentiate the following with respect to x and simplify the answer.

i. $\sin^6 x \cos^3 2x$;

ii. $\dfrac{(x^2+x+1)(4-x)}{2x-1}$;

iii. $\sin(x^2+3)\cos\sqrt{x^2+1}$;

iv. $e^{\cos 2x}$.

(b) Find the value of $\dfrac{dy}{dx}$ at the point specified:

i. $x^2+y^2=1$ at $(\sqrt{2},\sqrt{2})$;

ii. $x^2+xy+y^2=1$ at $(1,-1)$;

iii. $x\sin y+y^2=1+\dfrac{\pi^2}{4}$ at $\left(1,\dfrac{\pi}{2}\right)$.

(c) Find the following integrals:

i. $\displaystyle\int\left(2e^x+\frac{6}{x}+\ln 2\right)\,dx$;

ii. $\displaystyle\int\left(\frac{3+5x-6x^2-7x^3}{2x^2}\right)\,dx$.

(d) By using suitable substitution, find the following integrals .

i. $\displaystyle\int x^3\sqrt{x^4+1}\,dx$;

ii. $\displaystyle\int x^2(4x^3+3)^9\,dx$.

End of Exam