UNIVERSITY OF JAFFNA, SRI LANKA
BACHELOR OF PHARMACY
SECOND YEAR FIRST SEMESTER EXAMINATION- August 2017
PHAMM2111-PHARMACEUTICAL MATHEMATICS

Date:16.08.2017 Answer All Questions Time : One hour

1. (a) Find the value of the discriminant and describe the nature of the roots of the following quadratic equations and **solve** them.

   i. $x^2 + 12x + 32 = 0$;

   ii. $-6t^2 + 5 = -4t + 8$;

   iii. $r^2 - 6r = 9$.

   (b) Express as a single logarithm and, if possible, simplify the following:

   i. $2\ln(w-5) - \frac{1}{2}[\ln(x+y) - \ln(x-y)] - 3\ln z$;

   ii. $3\log_5(x+2) - 2\log_5(x-1) - 2\log_5(x-7)$;

   iii. $\log(x^2-16) - \log(x+4)$.

   (c) Use the change of base formula to change the following to *natural log*:

   i. $\log_2 17$;

   ii. $\log_7 12$.

   (d) Write down the expression for $\sin(A+B)$ and $\tan(A-B)$. Use the above expressions to find the following:

   i. $\sin\left(-\frac{7\pi}{12}\right)$;

   ii. $\tan\left(\frac{\pi}{12}\right)$;

   iii. $\tan 165°$.

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

   i. $\sin x \sec x \cot x = \sin x \sec x$;

   ii. $2\cos^2 x = 3\cos x - 1$;

   iii. $\tan^8 x - \tan^4 x = 0$.

2. (a) Find the following limits:

i. $\lim_{x\to 0}\left(\frac{3}{x}-\frac{3\cos x}{x}\right)$;

ii. $\lim_{x\to 3}\frac{\sqrt{x+1}-2}{x-3}$;

iii. $\lim_{x\to\infty}\frac{7x^3-3x^2+6}{6x^3+5x^2+3}$;

iv. $\lim_{x\to 0}\frac{\sin x-\sin x\cos x}{x^2}$.

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

i. $\frac{2x^2-4x}{(x-3)(x+1)}$, where $x\neq 3$, $x\neq -1$;

ii. $\ln(x+\sqrt{x^2+a^2})$, where a is a constant;

iii. $e^{-3x}\cos 3x$.

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

i. $\int (2x^2+3x+5)^3(4x+3)\,dx$;

ii. $\int (\sin(\tan x))\sec^2 x\,dx$;

iii. $\int \sin^6 x\cos x\,dx$;

iv. $\int_1^2 \frac{x}{(x^2+4)^2}\,dx$;

v. $\int_1^2 x^2(4+x^3)^{\frac{3}{2}}\,dx$.

End of Exam