

UNIVERSITY OF JAFFNA – SRI LANKA  
SECOND YEAR FIRST SEMESTER EXAMINATION – JULY 2013  
BACHELOR OF PHARMACY  
PHAMM 2101 PHARMACEUTICAL MATHEMATICS

Date: 19.08.2013

Answer All Questions

Time: One hour

1. (a) By examining the *discriminant*, determine how many real roots, if any, the following quadratic equations have and find them.

i.  $7x^2 - 10x - 5 = 0$

ii.  $25t^2 - 10t = -1$

[40 Marks]

(b) Use the logarithm laws to write each expression as a single logarithm.

i.  $2 \log_2 x + 3 \log_2 y - \frac{1}{2}(\log_2 a + \log_2 b)$

ii.  $4 \log_5(p + q) - \log_5(q - r) - \log_5 r$

[20 Marks]

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

i.  $\sin 225^\circ$

ii.  $\cos 15^\circ$

[40 Marks]

2. (a) Find the following limits.

i.  $\lim_{x \rightarrow -1} \frac{3x - 4}{8x^2 + 2x - 2}$

ii.  $\lim_{x \rightarrow 1} \frac{1 - \cos(x - 1)}{(x - 1)^2}$

[30 Marks]

Continued...

Continuation of Question 2...

(b) Assume that  $\lim_{x \rightarrow a} f(x) = 4$  and  $\lim_{x \rightarrow a} g(x) = 2$ . Find  $\lim_{x \rightarrow a} \frac{6x + 3}{xf(x) + g(x)}$ .  
[10 Marks]

(c) Find the derivative of the following functions with respect to  $x$ .

i.  $\frac{(x - 1)^3}{x(x + 3)^4}$

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

[40 Marks]

(d) Find the coordinates of the stationary points of  $f(x) = 2x^3 - 21x^2 + 72x - 5$ , and determine their nature.

[20 Marks]

3. (a) Evaluate  $\int xe^{-x} dx$  using integration by parts.

[20 Marks]

(b) In each case use the given substitution to find the integral.

i.  $\int_0^5 x^3 \sqrt{x^4 + 5} dx, \quad t = x^4 + 5$

ii.  $\int \frac{x \cos x^2}{\sqrt{\sin x^2}} dx, \quad t = \sin x^2$

[50 Marks]

(c) Differentiate  $y = \sqrt{9 - x^2}$  with respect to  $x$ . Hence find  $\int \frac{6x}{\sqrt{9 - x^2}} dx$ .

[30 Marks]

\*\*\*\*End of Exam\*\*\*\*