University of Jaffna, Sri Lanka
Faculty of Allied Health Sciences
First Year First Semester Examination in B.Pharm Honours - 2022
End of Course Examination
PHAPM1181 - Pharmaceutical Mathematics

Answer all questions

Time: One hour

1. (a) i. For what values of "k", the roots of the following quadratic equation

$$x^2 - 2(1+2k)x + 3 + 2k = 0$$

are equal?

ii. If m, n are the roots of the equation $3x^2 - 5x + 9 = 0$, then find the value of the following:

A. $m^2 + n^2$,

B. $\frac{1}{m^2} + \frac{1}{n^2}$.

(b) Solve the following logarithmic equations for x :

i. $\log_2 x + 3\log_2 2 = \log_2\left(\frac{2}{x}\right)$.

ii. $\log x - \log(x-1) = \log 4$.

iii. $\log_4(2x+4) - 2 = \log_4 3$.

(c) Find the domain of the following functions.

i. $f(x) = \sqrt{3x-6}$,

ii. $g(x) = \frac{x-12}{x^2-3x+2}$,

iii. $h(x) = \frac{\sqrt{7x-8}}{\sqrt[3]{5x-7}}$.

(d) Let $f(x) = x+2$ and $g(x) = x^2 - 2x$.

i. Find the composite functions $(f \circ g)(x)$ and $(g \circ f)(x)$.

ii. Compute $(f \circ g)(-1)$, $(g \circ f)(3)$ and $(f \circ f)(4)$.

(e) Let $g(x) = \frac{1}{x-2}$, where $x \neq 2$, be a function.

i. Find and simplify $\frac{g(x+h) - g(x)}{h}$.

Continued...

Continuation of question 1.

ii. Using above calculation in part i., compute $\lim_{h \longrightarrow 0} \left[\dfrac{g(x+h) - g(x)}{h} \right]$.

2. (a) Find the **derivative** of the following functions using appropriate rules.

i. $f(x) = \dfrac{x^4 + 4x^2}{3\sqrt{x}}$,

ii. $g(x) = \sqrt{3}\, x + \sqrt{x} + 5e$,

iii. $h(x) = (x^2 + 5)\left(\sqrt[4]{x} + \sqrt[8]{x^3}\right)$,

iv. $k(x) = \dfrac{x^2 e^x + 5}{7 - e^x}$,

v. $\ell(x) = \dfrac{3}{(x^2 + 3x + 4)^4}$.

(b) If Travis Head drops a cricket ball from a building 400 feet tall, its height above the ground(in feet) after t seconds is given by

$$H(t) = 400 - 16t^2.$$

i. Find $H'(t)$.

ii. Compute $H(2)$ and $H'(2)$.

(c) Find the following indefinite integrals.

i. $\displaystyle\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2 dx$,

ii. $\displaystyle\int \frac{2x^2 + x^3}{4x}\, dx$,

iii. $\displaystyle\int (x - 2)(x + 3)\, dx$,

iv. $\displaystyle\int \left(3\sqrt{x} - \frac{1}{x^2} - x^{\frac{3}{2}}\right) dx$.

(d) Evaluate the integral

$$\int \frac{e^x - e^{-x}}{e^x + e^{-x}}\, dx,$$

using an appropriate substitution.

(e) If $F(1) = 1$ and $\dfrac{dF(x)}{dx} = \dfrac{3}{x} + \dfrac{1}{x^2}$, then find $F(x)$.

END OF PAPER