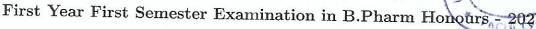
University of Jaffna, Sri Lanka Faculty of Allied Health Sciences



End of Course Examination

PHAPM1181 - Pharmaceutical Mathematics

1 4 DEL 2023

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 $\lim_{h \to 0} \left[\frac{g(x+h) g(x)}{h} \right]$.
- 2. (a) Find the derivative of the following functions using appropriate rules.

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

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

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

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

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

iii.
$$\int_{0}^{x} (x-2)(x+3) dx$$
,

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

(d) Evaluate the integral

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

using an appropriate substitution.

