UNIVERSITY OF JAFFNA, SRI LANKA
BACHELOR OF PHARMACY
Second Year First Semester Examination- 2014
PHAMM2101-Pharmaceutical Mathematics

Answer All Questions   Time Allowed: One hour

Q1. (a) A person's blood pressure depends on various factors including his / her age. For women, normal systolic blood pressure with her age is modeled by the equation

$$P = 0.01A^2 + 0.05A + 107,$$

where P is the normal blood pressure in millimeters of mercury(mm Hg)and A is the age. For men, the normal systolic blood pressure with his age is modeled by the equation

$$P = 0.006A^2 - 0.02A + 120.$$

(i) Find the normal blood pressure of a woman who is 35 years old.

(ii) Find the approximate age of a man whose blood pressure is 134mm Hg.

[40 Marks]

(b) Condense each logarithmic expression:

(i) $3\log_5(x+2) - 2\log_5(x-1) - 2\log_5(x-7)$,

(ii) $\log(2a^3b^{-2}) - \log(8a^{-5}b^6)$.

[20 Marks]

(c) Solve the following equations:

(i) $\sin^3 x - 5\sin^2 x + 6\sin x = 0$,

(ii) $4\cos^2 x + 2\cos x - 2 = 0$.

[40 Marks]

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Q2. (a) Evaluate the following limits:

(i) $\lim\limits_{x \to 0} \dfrac{\dfrac{3}{4+x} - \dfrac{3}{4}}{x}$,

(ii) $\lim\limits_{a \to -4} \dfrac{a^3 + 64}{a + 4}$,

(iii) $\lim\limits_{t \to -\infty} \dfrac{t^2 + 9t - 10}{2 + 4t - 3t^2}$,

(iv) $\lim\limits_{x \to 0} \dfrac{1 - \cos^2 3x}{x(1 + \cos 3x)}$,

(v) $\lim\limits_{x \to 0} \dfrac{x}{\sqrt{2+x} - \sqrt{2-x}}$.

[50 Marks]

(b) Differentiate the following with respect to x :

(i) $\dfrac{(x^2 + x + 1)(4 - x)}{2x - 1}$,

(ii) $\sqrt{\dfrac{1 - 2x}{3x + 2}}$.

[30 Marks]

(c) Let f and g be differentiable functions such that $f(2) = 3$, $g(2) = -5, f'(2) = -1$ and $g'(2) = 2$.
Find the following:

(i) $(g - f)'(2)$,

(ii) $(5f + 3g)'(2)$.

[20 Marks]

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Q3. (a) Determine the following integrals:

(i) $\int (3x^2 - x + 1)\, dx$,

(ii) $\int \dfrac{\cos x}{1 + \sin x}\, dx$,

(iii) $\int \sin^2 x\, dx$.

[30 Marks]

(b) In each case use a suitable substitution to find the integral:

(i) $\int \dfrac{4x}{\sqrt{2x^2 + 1}}\, dx$,

(ii) $\int \dfrac{\cos x}{(5 + \sin x)^2}\, dx$,

(iii) $\int e^{\sin x} \cos x\, dx$,

(iv) $\int \dfrac{1}{\sqrt{x^2 + 9}}\, dx$.

[60 Marks]

(c) Determine the coordinates of the stationary points on the curve

$$y = 2x^3 - 3x^2 - 12x.$$

[10 Marks]

End of Exam