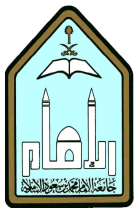
بسم اللّه الرَّحمَن الرَّحِيم

Kingdom of Saudi Arabia
Ministry of Higher Education
Al-Imam Mohammed Ibn Saud Islamic University
- College of Science -
Department: Maths & Stat.
1^{st} Semester/Year: 1438-1439
Duration: 2 hours



المَملَكَة العَرَبِية السَعُودِية
وزَارَة التَّعلِيم العَـــــالِي
جَامِعَة الإِمَام مُحَمَّد بن سَعُود الإِسلَامِية
-كلِّيـــــة العُـــــلوم-
Course Name: Applied Cal. 1
Course Code: MAT 113
Coordinator:

Final Exam

Question 1. [2+2+2+2+2=10 marks]

1) Evaluate each of the following limits:

$$a)\ \lim_{x\to 0}\frac{\sqrt{1+x}-\sqrt{1+x^2}}{x}, \quad b)\ \lim_{x\to 1}\frac{\ln(2-x^2)}{x^2-x},$$

$$c)\ \lim_{x\to -\infty}\frac{\sqrt{9x^2-1}}{3x+5}, \qquad d)\ \lim_{x\to 0} x\csc(2x).$$

2) Find all vertical and horizontal asymptotes of the function $f(x)=\dfrac{2x^2+1}{x^2+x-6}$.

Question 2. [2+2+2+2+2=10 marks]

1) Compute the derivatives of the following functions:

$$a)\ f(x)=\sqrt{\sin^2 x+3}-\ln(x^2-3x), \qquad b)\ g(x)=\frac{e^{x^2}+x}{\sqrt{x}}.$$

2) Find the equation of the tangent line to the graph of $f(x)=(2x^3+3)(x-1)$ at $a=1$.

3) Use implicit differentiation to find y' if $y^4+xy^2-5y=3x$.

4) Verify the conditions of Rolle's theorem and find all values of c satisfying the conclusion of it for the function $f(x)=x^4-2x^2$ on [-2, 2].

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Question 3. **[2+2+3+1+3+1=12 marks]**

Consider the function f defined by $f(x) = x^3 + 3x^2 - 4$.

1) Find the critical numbers of the function f.

2) Find the absolute extrema of the function f on the interval $[\,-1, 1\,]$.

3) Determine the intervals on which the function f is increasing and the ones where f is decreasing.

4) Find the local extrema of the function f.

5) Determine the intervals where the graph of f is concave up and the ones where it is concave down.

6) Find the inflection point of the graph of f.

Question 4. **[2+2+2+2=8 marks]**

Evaluate each of the following integrals:

$$a) \int \frac{(\sqrt{x}+2)^2}{\sqrt{x}}\,dx, \qquad b) \int x\sqrt{x+4}\,dx.$$

$$c) \int_1^2 \frac{xe^{3x}-2}{x}\,dx, \qquad d) \int_0^1 x\cos(\pi x^2)\,dx.$$