Kingdom of Saudi Arabia
Ministry of higher Education
Al-Imam Mohammad Ibn Saud Islamic University
--- College of Science ---

بسم الله الرحمن الرحيم

ملكة العربية السعودية
وزارة التعليم العالي
جامعة الإمام محمد بن سعود الإسلامية
كلية العلوم
قسم الرياضيات و الإحصاء

Department: Mathematics & Statistics
Semester/Year: First /1435-1436

Course Name: Applied Calculus (I)
Course Code: MAT113

Duration: 90 minutes

Instructions:

Cell phones, calculators and any other devices are NOT ALLOWED in the exam.

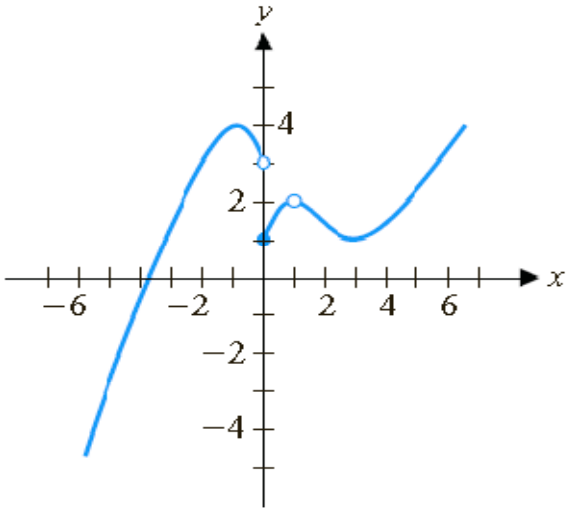
Midterm 1

QUESTION 1 [4=0.5+0.5*5+1 points]: Let f be the function represented by the graph

1) Find the domain of f.
2) Compute each of the following limits (if the limit does not exist, explain why)

$a)\ \lim_{x\to(-1)^+} f(x)$
$b)\ \lim_{x\to 0^-} f(x)$
$c)\ \lim_{x\to 0^+} f(x)$
$d)\ \lim_{x\to 1^+} f(x)$
$e)\ \lim_{x\to 1^-} f(x).$

3) Determine the points where f is discontinuous.



QUESTION 2 [3=3*1 points]: Compute each of the following limits (if the limit does not exist, explain why) :

1) $\lim_{x\to -3} \dfrac{x^2 - x + 12}{x+3}$ **2)** $\lim_{x\to 1} \dfrac{|x-1|}{x-1}$ **3)** $\lim_{x\to 4} \dfrac{4-x}{2-\sqrt{x}}$.

QUESTION 3 [2 points]: For what value of a is the function f continuous where

$$f(x) = \begin{cases} ax - 1 & if\ x < 2 \\ ax^2 - 2 & if\ x \geq 2. \end{cases}$$

QUESTION 4 [4= 2*2 points]: Find all horizontal and vertical asymptotes of the function

$$f(x) = \frac{x^2 + 2x + 1}{1 - x^2}.$$

QUESTION 5 [3 points]: Use the Intermediate Value Theorem to show that there is a root of that the equation: $x^3 - 2x^2 + 5 = e^x$ in the interval $[-2,1]$.

QUESTION 6 [4=4*1 points]: Find the derivative of f, if

1) $f(x) = \ln(2x+1)$; **2**) $f(x) = x^8 \cos(3x)$; **3**) $f(x) = \sqrt{x}e^{-2x}$; **4**) $f(x) = \dfrac{x}{2x+1}$.

Extra exercise (bonus) [2 points]: Let $f(x)$ be a function such that: $\frac{\sin(2x)}{x} < f(x) \leq 2 + x^2$, for all $x \in (-1,1)$. Find $\lim_{x\to 0} f(x)$.