

KING SAUD UNIVERSITY COMMON FIRST YEAR

BASIC SCIENCES DEPARTMENT

Math 101 Mid term Exam 1438/1439 H.

First Semester

Time Allowed - 2 Hours

St. Name:

St. ID:

Section:

ملاحظة اكتب خطوات الحل بالتفصيل لجميع الأسئلة داخل دفتر الإجابة (الإجابة على ورقة الأسئلة غير معتمدة). علمًا بأن عدد الأسئلة (٥). وعدد الصفحات (١).

Question 1:

(4 Marks)

- A) Solve the following inequality, and write your answer in interval notation $-5 < 2x - 3 \le 7$
- B) Determine algebraically is the function $f(x) = \frac{x^4 + x^2}{|x|}$ even, odd, or neither.

Question 2:

(7 Marks)

A) Let
$$f(x) = \frac{7}{4 - x^2}$$
, $g(x) = \sqrt{x}$. Find:

1)
$$(f \circ g)(x)$$
.

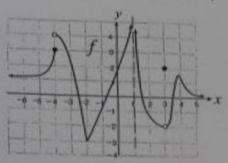
- B) Given that $f(x) = \frac{1-2x}{3x+2}$ is a one-to-one function, find $f^{-1}(x)$.
- C) If $3 \sec \theta + 5 = 0$, $\sin \theta > 0$, then find $\sin (2\theta)$.

Question 3:

Use the graph of y = f(x) to find the following:

- a) $\lim f(x)$
- b) The horizontal and vertical asymptote(s) for the graph of f(x).
- c) The x-value(s) in the domain at which f(x)is not differentiable.

(4 Marks)



(9 Marks)

Evaluate each of the following limits (if exist).

1)
$$\lim_{x \to 0} \frac{x+8}{x^2+2}$$

3)
$$\lim_{x \to 4} \frac{x-4}{\sqrt{x-2}}$$

5)
$$\lim_{x \to 0} x^2 \cos\left(\frac{3}{x}\right)$$

2)
$$\lim_{x \to 0} \frac{\sin(5x) + \tan(3x)}{2x}$$

4)
$$\lim_{x \to 2} \frac{x^2 - 4}{x^2 - 3x + 2}$$

6)
$$\lim_{x \to \infty} \cos \left(\frac{\pi x + 1}{x^2 + 3} \right)$$

Question 6:

(6 Marks)

A) Let $f(x) = x^2 + 3$, then use the definition of derivative to find f'(x)

B) Find all vertical and horizontal asymptotes (if any) for $f(x) = \frac{\sqrt{9x^2 + 13}}{2x - 3}$

C) Find the values of a and b such that the function $g(x) = \begin{cases} \frac{x^2 + bx + 5}{x - 1}, & x \neq 1 \\ a, & x = 1 \end{cases}$ is continuous at every real number.

Good Luck

ميد الترم الاول البديل



KING SAUD UNIVERSITY COMMON FIRST YEAR

BASIC SCIENCES DEPARTMENT

Alternative Math 101 Mid term Exam 1438/1439 H.

First Semester

Time Allowed - 2 Hours

St. Name: St. ID: 438101095 Section:

ملاحظة: اكتب خطوات الحل بالتفصيل لجميع الأسئلة داخل دفتر الإجابة (الإجابة على ورقة الأسئلة غير معتمدة).
علمًا بأن عدد الأسئلة (٥)، وعدد الصفحات (١).

Question 1:

(4 Marks)

A) Solve the following inequality, and write your answer in interval notation $3-2|3x-1| \ge 6$

B) Determine algebraically is the function $f(x) = \frac{2x^3 + x}{\cos x}$ even, odd, or neither.

Question 2:

(7 Marks)

A) Let
$$f(x) = \frac{7}{\sqrt{x-2}}$$
, $g(x) = x^2 + 2$. Find:

1)
$$(f \circ g)(x)$$
.

2)
$$D_f$$
, D_g , and $D_{f \circ g}$.

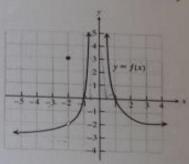
- B) Show that $f(x) = x^2 + x 6$, x < 0 is a one-to-one function.
- C) Find the exact value of $\sin \left(\cos^{-1}\left(\frac{2}{3}\right)\right)$.

Question 3:

Use the graph of y = f(x) to find the following:

- a) $\lim_{x\to -2} f(x)$
- b) The horizontal and vertical asymptote(s) for the graph of f(x).
- c) The x-value(s) in the domain at which f(x) is not differentiable.







(9 Marks)

Evaluate each of the following limits (if exist),

1)
$$\lim_{x \to 0} \frac{1 + \sin x}{x^2 - 1}$$

3)
$$\lim_{x \to 3} \frac{\sqrt{x+1}-2}{x^2-4x+3}$$

5)
$$\lim_{x \to 0} x^4 \sin\left(\frac{1}{x^2}\right)$$

2)
$$\lim_{x\to 0} \frac{1+\sin(2x)-\cos(x)}{2x}$$

4)
$$\lim_{x \to 3} \frac{x^2 - 9}{x^2 - x - 6}$$

6)
$$\lim_{x \to \infty} \sqrt[3]{\frac{x+4}{8x+3}}$$

Question 6:

(6 Marks)

A) Let $f(x) = x^2 + 2x - 4$, then use the definition of derivative to find f'(x)

B) Find all vertical and horizontal asymptotes (if any) for $f(x) = \frac{\sqrt{x^2 - 5}}{|x| + 5}$

C) Find the values of a and b such that the function $f(x) = \begin{cases} ax + b, & x > 1 \\ 5x + 2a, & x < 1 \\ 4, & x = 1 \end{cases}$ is continuous at every real number.

Good Luck

ميد الترم الثاني

A) Use definition of limit to show that $\lim_{x\to 2} (2x+3) = 7$. 3) Use the Intermediate Value Theorem to show that $f(x) = x^5 - 4x^3 + 1$ has a in the interval $[0,1]$.	COMMON PIETS YEAR BASIC SCIENCES DEPARTMENT Math 101 Mid term Exam 1438/1430 H. Second Sementer Time Allowed - 2 Hours St. Name: St. ID: Section: St. Name: St. ID: Section: St. ID: Section: St. Name: St. ID: Section: Section: St. ID: Section: St. ID: Section: Section: Section: Section: Section: Section: Section: Section: St. ID: Section: S				
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KING SAUD UNIVERSITY COMMON FIRST YEAR BASIC SCIENCES DEPARTMENT

Question 4:

(9 Marks)

C) Evaluate each of the following limits (if exist).

1)
$$\lim_{x \to 0} \frac{x^2 + 3}{x + 1}$$

2)
$$\lim_{x \to 0} x^2 \sin\left(\frac{1}{x}\right)$$

3)
$$\lim_{x \to 3} \frac{x^2 - 9}{x^2 - 7x + 12}$$

4)
$$\lim_{x \to 0} \frac{1 - \cos x}{x^2}$$

5)
$$\lim_{x \to \infty} \tan \left(\frac{\pi x^2 - x}{x^2 + 5x} \right)$$
 6) $\lim_{x \to 1} \frac{x - 1}{\frac{1}{x^5} - x^5}$

6)
$$\lim_{x \to 1} \frac{x - 1}{\frac{1}{x^5} - x^6}$$

Question 5:

(6 Marks)

A) Let $f(x) = 2x^2 + 5$, then use the definition of derivative to find f'(x).

B) Find all vertical and horizontal asymptotes (if any) for $f(x) = \frac{2x-5}{|x|+3}$

C) Find the value of k such that

$$f(x) = \begin{cases} \frac{x^3 - 8}{x - 2}, & x \neq 2\\ 3k + 1, & x = 2 \end{cases}$$

is continuous at x=2.

Good Luck

ميد البديل الترم الثاني

1- اكتب خطوات الحل بالتفصيل لجميع الأسئلة داخل دفتر الإجابة (الإجابة على ورقة الأسئلة غير معتمدة):

علمًا بأن عدد الأسئلة (٥). وعدد الصفحات (٢).

2- لا يسمح بالكتابة إلا بالقلم الأزرق فقط.

لا يسمح بتدوال الآلة الحاسبة بين الطلاب.

لا تستخدم ألة حاسبة قابلة للبرمجة أو ألة حاسبة ترسم دوال.

Question 1: (5 Marks)

A) Determine algebraically whether the function $f(x) = \left| \frac{2x^4 + x^2}{\sin x} \right|$ is even, odd, or neither.

B) Solve $|1-2|2x-3| \ge -6$

(6 Marks)

Question 2:

A) Let $f(x) = \frac{3}{\sqrt{x-4}}$, $g(x) = x^2 + 4$. Find:

1) $(f \circ g)(x)$.

2) D_f , D_g , and $D_{f \circ g}$.

B) Show that $f(x) = x^2 - 4x - 5$, x > 2 is a one-to-one function.

C) Find the exact value of $\cos\left(2\cos^{-1}\left(\frac{4}{5}\right)\right)$, without using calculator.

uestion 3: (4 Marks)

A) Use definition of limit to show that $\lim_{x\to 0} (3x + 4) = 4$.

When the Intermediate Value Theorem to show that $f(x) = x^2 - \frac{9}{x} + 1$ has a zero in the interval [1, 3].

C) Evaluate each of the following limits (if exist):

- 1) $\lim_{x \to 1} \frac{x^2 + 4}{2x + 2}$
- 3) $\lim_{x \to 3} \frac{\sqrt{x+1} 2}{x^2 9}$
- 2) $\lim_{x \to 0} x^6 \sin\left(\frac{1}{x^2}\right)$ 4) $\lim_{x \to 3} \frac{\sqrt{x+1} - 2}{x^2 - 4x + 3}$ 6) $\lim_{x \to 2} \frac{x^2}{x^2 - 4x + 3}$
- 5) $\lim_{x \to \infty} \tan \left(\frac{\pi x x}{x^2 + 5x} \right)$

Question 5:

(6 Marks)

- A) Let $f(x) = 3x^2 2$, then use the definition of derivative to find f'(x).
- B) Find all vertical and horizontal asymptotes (if any) for $f(x) = \frac{2x-5}{x+3}$
- C) Find the values of a and b such that the function $f(x) = \begin{cases} 3x + 2a, & x < 1 \\ 4, & x = 1 \end{cases}$ is continuous at every real number.

Good Luck



KING SAUD UNIVERSITY COMMON FIRST YEAR BASIC SCIENCES DEPARTMENT Math 101 Final Exam 1438/1439 H.

First Semester

Time Allowed - 3 Hours

St. Name:	St. ID:	Section:	
		<u>ﻣﻼﺣﻈﺎﺕ</u> :	
	دفتر الإجابة (الإجابة على ورقة الأسئلة غير معتمدة).	 اكتب خطوات الحل بالتفصيل لجميع الأسئلة داخل 	
		علمًا بأن عدد الأسئلة (٦). وعدد الصفحات (٢).	
		 2- لا يسمح بالكتابة إلا بالقلم الأزرق فقط. 	
		 3- لا يسمع بتدوال الآلة الحاسبة بين الطلاب. 	
Question 1:		(4 Marks)	

A) Solve the following inequality, and write your answer in interval notation

$$|2x-6| \leq 4$$

B) Use definition of limit to show that $\lim_{x \to 1} (2x + 3) = 5$.

Question 2:

(12 Marks)

Evaluate each of the following limits (if exist):

1)
$$\lim_{x\to 1} \left(2x + 4\right)^2$$

2)
$$\lim_{x\to 2} \frac{x^2 + 3x - 10}{x - 2}$$

3)
$$\lim_{x\to 0} \frac{\sqrt{x+9}-3}{x}$$

4)
$$\lim_{x\to 0} \frac{x^2-2x}{x}$$

5)
$$\lim_{x\to\infty} \left[1 + \cos\left(\frac{3}{2x+1}\right) \right]$$

6)
$$\lim_{x\to 2} \frac{4x+3}{x-2}$$

Question 3:

(6 Marks)

A) Prove that if a function f is differentiable at a, then f is continuous at a.

B) Discuss the continuity of
$$f(x) = \begin{cases} x+3 & , & x \le 0 \\ \frac{\sin(6x)}{2x} & , & x > 0 \end{cases}$$
 at $x = 0$.

C) The position of a particle is given by the equation $s(t) = \frac{t-1}{t+1}$, where s is measured in meters and t in seconds. What is the acceleration of the particle after 3 seconds?



(12 Marks)

Find the derivative $\frac{dy}{dx}$ for each of the following functions:

$$1) y = \sin x + 2\cos x$$

2)
$$y = (3x^2 + 5x + 2)^{30}$$

3)
$$y = \sqrt{5x^2 + 7}$$

4)
$$y = x^2 \tan(3x)$$

5)
$$y = \tan^{-1}(4x)$$

$$6) \frac{x^2 + y^2}{\sec x} = 1$$

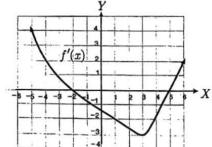
Question 5:

(6 Marks)

A) Given that $g(x) = 3x^2 + 5x + 1$, find the equation of the tangent line to the graph of g(x) at (1,9).

B) Show that the function $f(x) = x^2 + x$ satisfies the conditions of the Mean Value Theorem on [-4,6]. Then find a number c that satisfies the conclusion of the theorem.

C) The figure shows the graph of f'(x). Determine the local minimum and local maximum of the function f(x).



Question 6:

(10 Marks)

For the function $f(x) = x^4 - 4x^2$, find the following (if any):

- 1) The critical numbers of f.
- 2) The interval(s) on which f is increasing and decreasing.
- 3) The local extrema of f.
- 4) The interval(s) on which f is concave upward or downward.
- 5) Sketch the graph of f.

Good Luck



فاينل الترم الاول البديل



KING SAUD UNIVERSITY
COMMON FIRST YEAR
BASIC SCIENCES DEPARTMENT
Math 101 Final Exam 1438/1439 H.

First Semester "Alternative" Time Allowed - 3 Hours

St.	Name:		

Section:

ملاحظات:

١- اكتب خطوات الحل بالتفصيل لجميع الأسئلة داخل دفتر الإجابة (الإجابة على ورقة الأسئلة غير معتمدة).

علما بأن عدد الأسئلة (٦)، وعدد الصفحات (٢).

- ٢- لا يسمح بالكتابة إلا بالقلم الأزرق فقط.
- ٣- لا يسمع بندوال الآلة العاسبة بين الطلاب.

Question 1: (4 Marks)

A) Solve the following inequality, and write your answer in interval notation

$$x^2 \ge x + 2$$

B) Use definition of limit to show that $\lim_{x \to -2} (5 - 2x) = 9$.

Question 2: (12 Marks)

Evaluate each of the following limits (if exist):

1)
$$\lim_{x \to 0} \frac{1 - \cos x}{x^2 + 1}$$

2)
$$\lim_{x \to 1} \frac{x-1}{x^2-x}$$

3)
$$\lim_{x \to 4} \frac{\sqrt{x} - 2}{x - 4}$$

4)
$$\lim_{x \to 0} \frac{1 - \cos x}{x^2}$$

5)
$$\lim_{x \to 0} x^2 \cos\left(\frac{2}{x}\right)$$

6)
$$\lim_{x \to -\infty} \left(\sqrt{9x^2 - x} - 3x \right)$$

Question 3:

(6 Marks)

- A) Prove that $\frac{d}{dx}(\sin x) = \cos x$.
- B) Discuss the continuity of $f(x) = \begin{cases} x^2 5 & , & x \le 0 \\ \frac{\sin(4x)}{3x} & , & x > 0 \end{cases}$ at x = 0.
- C) The Velocity of a particle is given by the equation $v(t) = \frac{t+5}{t+2}$, where t is measured in seconds. What is the acceleration of the particle after 6 seconds?



(12 Marks)

Find the derivative $\frac{dy}{dx}$ for each of the following functions:

$$y = 3x^3 + x^2 + 7x$$

2)
$$y = \sqrt[3]{x^2 + 5x}$$

3)
$$y = \sqrt{x + \sec x}$$

4)
$$y = \frac{\sin x}{1 + \cos x}$$

5)
$$y = x^3 \sin^{-1}(3x)$$

$$6) \sqrt{1 + \cos^2 y} = xy$$

Question 5:

(6 Marks)

- A) Given that $f(x) = x^2 2x + 3$, find the equation of the tangent line to the graph of g(x) at x = 3.
- B) Show that the function $f(x) = x^3 + 2x^2 + 4$ satisfies the conditions of the Mean Value Theorem on [-1,0]. Then find a number c that satisfies the conclusion of the theorem.
- C) Find k given that $f(x) = kx^2 + \frac{1}{x^2}$ has (1, f(1)) as an inflection point.

Question 6:

(10 Marks)

For the function $f(x) = x^4 + x^2 - 2$, find the following (if any):

- 1) The critical numbers of f.
- 2) The interval(s) on which f is increasing and decreasing.
- 3) The local extrema of f.
- 4) The interval(s) on which f is concave upward or downward.
- 5) Sketch the graph of f.

Good Luck