ميد الترم الاول

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

Question 1: (4 Marks)

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

$$-5 < 2x - 3 \leq 7$$

B) Determine algebraically is the function $f(x) = \dfrac{x^4 + x^2}{|x|}$ even, odd, or neither.

Question 2: (7 Marks)

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

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

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

B) Given that $f(x) = \dfrac{1 - 2x}{3x + 2}$ is a one-to-one function, find $f^{-1}(x)$.

C) If $3 \sec \theta + 5 = 0$, $\sin \theta > 0$, then find $\sin(2\theta)$.
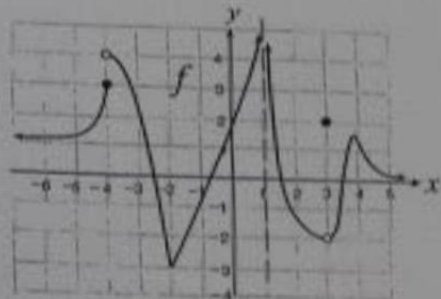
Question 3: (4 Marks)

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

a) $\lim\limits_{x \to 3} f(x)$

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.

Question 4:

(9 Marks)

Evaluate each of the following limits (if exist).

1) $\lim\limits_{x \to 0} \dfrac{x + 8}{x^2 + 2}$

2) $\lim\limits_{x \to 0} \dfrac{\sin(5x) + \tan(3x)}{2x}$

3) $\lim\limits_{x \to 4} \dfrac{x - 4}{\sqrt{x} - 2}$

4) $\lim\limits_{x \to 2} \dfrac{x^2 - 4}{x^2 - 3x + 2}$

5) $\lim\limits_{x \to 0} x^2 \cos\left(\dfrac{3}{x}\right)$

6) $\lim\limits_{x \to \infty} \cos\left(\dfrac{\pi x + 1}{x^2 + 3}\right)$

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 $f(x) = \dfrac{\sqrt{9x^2 + 13}}{2x - 3}$

C) Find the values of a and b such that the function $g(x) = \begin{cases} \dfrac{x^2 + bx + 5}{x - 1} & , \quad x \neq 1 \\ a & , \quad x = 1 \end{cases}$

is continuous at every real number.

Good Luck

ميد الترم الاول البديل

St. Name: لبدر إبراهيم العتيبي   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 (٢).

Question 1:
(4 Marks)

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

$$3 - 2|3x - 1| \geq 6$$

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

Question 2:
(7 Marks)

A) Let $f(x) = \dfrac{7}{\sqrt{x - 2}}$, $g(x) = x^2 + 2$. 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 $\sin\left[\cos^{-1}\left(\dfrac{2}{3} \right) \right]$.
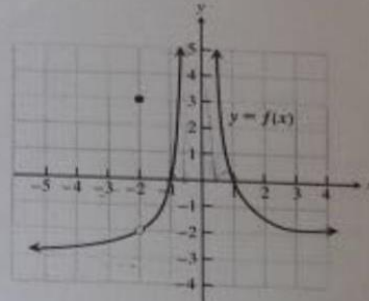
Question 3:
(4 Marks)

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

a) $\lim\limits_{x \to -2} f(x)$

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.

يتبع ➡ P2

Question 4: (9 Marks)

Evaluate each of the following limits (if exist).

1) $\lim\limits_{x \to 0} \dfrac{1 + \sin x}{x^2 - 1}$

2) $\lim\limits_{x \to 0} \dfrac{1 + \sin(2x) - \cos(x)}{2x}$

3) $\lim\limits_{x \to 3} \dfrac{\sqrt{x + 1} - 2}{x^2 - 4x + 3}$

4) $\lim\limits_{x \to 3} \dfrac{x^2 - 9}{x^2 - x - 6}$

5) $\lim\limits_{x \to 0} x^4 \sin\left(\dfrac{1}{x^2}\right)$

6) $\lim\limits_{x \to \infty} \sqrt[3]{\dfrac{x + 4}{8x + 3}}$

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 $f(x) = \dfrac{\sqrt{x^2 - 5}}{|x| + 5}$

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

KING SAUD UNIVERSITY

COMMON FIRST YEAR

BASIC SCIENCES DEPARTMENT

Math 101 Mid term Exam 1438/1439 H.

Second Semester

Time Allowed - 2 Hours

St. Name: _____   St. ID: _____   Section: _____

ملاحظات :

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

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

٢- لا يسمح بالكتابة إلا بالقلم الأزرق فقط.

٣- لا يسمح بتداول الآلة الحاسبة بين الطلاب.

٤- لا تستخدم آلة حاسبة قابلة للبرمجة أو آلة حاسبة ترسم دوال.

Question 1:   (5 Marks)

A) Determine algebraically whether the function $f(x) = \dfrac{x^5 + 3x}{x^4 + x^2}$ is even, odd, or neither.

B) Find the domain of $f(x) = \sqrt{x^2 - x - 6}$

Question 2:   (6 Marks)

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

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

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

B) Show that $f(x) = 3x + 2$ is a one-to-one function, and find $f^{-1}(x)$.

C) Find the exact value of $\sin\left(2\cos^{-1}\left(\dfrac{3}{5}\right)\right)$, without using calculator.

Question 3:   (4 Marks)

A) Use definition of limit to show that $\lim\limits_{x \to 2} (2x + 3) = 7$.

B) Use the Intermediate Value Theorem to show that $f(x) = x^5 - 4x^3 + 1$ has a zer in the interval $[0, 1]$.

يتبع ⟹ P2

Question 4: (9 Marks)

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

1) $\lim\limits_{x \to 0} \dfrac{x^2 + 3}{x + 1}$

2) $\lim\limits_{x \to 0} x^2 \sin\left(\dfrac{1}{x}\right)$

3) $\lim\limits_{x \to 3} \dfrac{x^2 - 9}{x^2 - 7x + 12}$

4) $\lim\limits_{x \to 0} \dfrac{1 - \cos x}{x^2}$

5) $\lim\limits_{x \to \infty} \tan\left(\dfrac{\pi x^2 - x}{x^2 + 5x}\right)$

6) $\lim\limits_{x \to 1} \dfrac{x - 1}{x^{\frac{1}{5}} - x^{\frac{6}{5}}}$

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 $f(x) = \dfrac{2x - 5}{|x| + 3}$

C) Find the value of k such that

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

is continuous at $x = 2$.

Good Luck

(5 Marks)

Question 1:

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

B) Solve $1 - 2\left|2x - 3\right| \geq -6$

(6 Marks)

Question 2:

A) Let $f(x) = \dfrac{3}{\sqrt{x - 4}}$, $g(x) = x^2 + 4$. 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 $\cos\left(2\cos^{-1}\left(\dfrac{4}{5}\right)\right)$, without using calculator.

(4 Marks)

Question 3:

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

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

يتبع ➡ P2

Question 4:

C) Evaluate each of the following limits (if exist):   (9 Marks)

1) $\lim\limits_{x \to 1} \dfrac{x^2 + 4}{2x + 2}$

2) $\lim\limits_{x \to 0} x^6 \sin\left(\dfrac{1}{x^2}\right)$

3) $\lim\limits_{x \to 3} \dfrac{\sqrt{x+1} - 2}{x^2 - 9}$

4) $\lim\limits_{x \to 3} \dfrac{\sqrt{x+1} - 2}{x^2 - 4x + 3}$

5) $\lim\limits_{x \to \infty} \tan\left(\dfrac{\pi x - x}{x^2 + 5x}\right)$

6) $\lim\limits_{x \to \infty} \dfrac{x^2}{\sqrt{x} - 1}$

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 $f(x) = \dfrac{2x - 5}{x + 3}$

C) Find the values of a and b such that the function $f(x) = \begin{cases} 2ax + 4b, & x > 1 \\ 3x + 2a, & x < 1 \\ 4, & x = 1 \end{cases}$

is continuous at every real number.

Good Luck

First Year Common

St. Name: _____   St. ID: _____   Section: _____

ملاحظات :

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

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

2- لا يسمح بالكتابة إلا بالقلم الأزرق فقط.

3- لا يسمح بتداول 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 $\lim\limits_{x \to 1} (2x + 3) = 5$.

Question 2: (12 Marks)

Evaluate each of the following limits (if exist):

1) $\lim\limits_{x \to 1} (2x + 4)^2$

2) $\lim\limits_{x \to 2} \dfrac{x^2 + 3x - 10}{x - 2}$

3) $\lim\limits_{x \to 0} \dfrac{\sqrt{x + 9} - 3}{x}$

4) $\lim\limits_{x \to 0} \dfrac{x^2 - 2x}{x}$

5) $\lim\limits_{x \to \infty} \left[1 + \cos\left(\dfrac{3}{2x + 1} \right) \right]$

6) $\lim\limits_{x \to 2} \dfrac{4x + 3}{x - 2}$

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 $f(x) = \begin{cases} x + 3 & , & x \leq 0 \\ \dfrac{\sin(6x)}{2x} & , & x > 0 \end{cases}$ at $x = 0$.

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

يتبع ← P2

Question 4: (12 Marks)

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

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

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

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

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

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

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

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 $f(x)$.
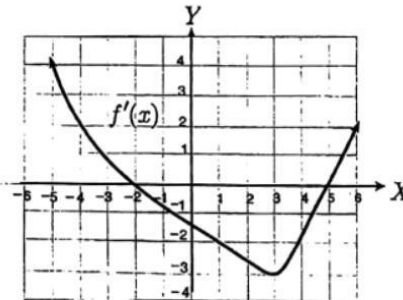
Question 6: (10 Marks)

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

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: _____ St. ID: _____ 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 يسمح بتداول الآلة الحاسبة بين الطلاب.

Question 1: (4 Marks)

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

$$x^2 \geq x + 2$$

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

Question 2: (12 Marks)

Evaluate each of the following limits (if exist):

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

2) $\lim\limits_{x \to 1} \dfrac{x - 1}{x^2 - x}$

3) $\lim\limits_{x \to 4} \dfrac{\sqrt{x} - 2}{x - 4}$

4) $\lim\limits_{x \to 0} \dfrac{1 - \cos x}{x^2}$

5) $\lim\limits_{x \to 0} x^2 \cos\left(\dfrac{2}{x}\right)$

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

Question 3: (6 Marks)

A) Prove that $\dfrac{d}{dx}(\sin x) = \cos x$.

B) Discuss the continuity of $f(x) = \begin{cases} x^2 - 5 & , \quad x \leq 0 \\ \dfrac{\sin(4x)}{3x} & , \quad x > 0 \end{cases}$ at $x = 0$.

C) The Velocity of a particle is given by the equation $v(t) = \dfrac{t + 5}{t + 2}$, where t is measured in seconds. What is the acceleration of the particle after 6 seconds?

يتبع ⟹ P2

Question 4:   (12 Marks)

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

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

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

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

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

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 $f(x) = kx^2 + \dfrac{1}{x^2}$ 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