Time allowed : **2 Hours**

| St. Name: | |
|---|---|
| Section: | St. ID: |

ملاحظة: - أكتب خطوات الحل بالتفصيل لجميع الأسئلة داخل دفتر الإجابة

- أي إجابة لسؤال أو فرع من الأسئلة على ورقة الأسئلة **لا تعتمد.**

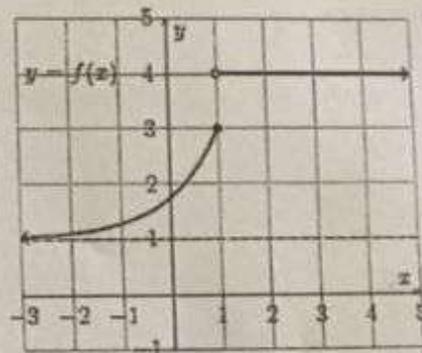*This Exam consists of (6) essay questions pointed in two pages of (30) marks.*

## QUESTION 1:

(3 Mark)

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

a) $\lim\limits_{x \to 1} f(x)$

b) $f(1)$

c) The horizontal asymptote(s) for the graph of $f(x)$.



## QUESTION 2:

(9 Marks)

Evaluate each of the following limits (if exist).

a) $\lim\limits_{x \to 1} (2x^3 - 3x^2 - 4)$

b) $\lim\limits_{x \to 0} \dfrac{\sin 5x + \tan 3x}{4x}$

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

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

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

f) $\lim\limits_{x \to 0} \left[ x^2 \cos\left(x + \dfrac{1}{x}\right) \right]$.

## QUESTION 3:

(3 Marks)

a) Let $\lim\limits_{x \to 2} f(x) = 4$ and $\lim\limits_{x \to 2} g(x) = -3$. Find $\lim\limits_{x \to 2} \left[ 3f(x) + \dfrac{6}{g(x)} \right]$.

b) Find the vertical asymptote(s) of $f(x) = \dfrac{4x^2 - 2}{3x - 6}$ (if any).

**a)** Discuss the Continuity of the function $f(x) = \begin{cases} \dfrac{1-\cos x}{x \sin x} & , \; x \neq 0 \\ \\ 2 & , \; x = 0 \end{cases}$ at $x = 0$

(3 Marks)

**b)** Find an equation of the line tangent to the graph of $y = 3x^2 - 1$ at $x = 1$

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## QUESTION 5:

(3 Marks)

**a)** Write the value of $\lim\limits_{h \to 0} \dfrac{(1+h)^5 - 1}{h}$ , using the derivative notation.

**b)** Suppose that $\dfrac{d}{dx}\left[f\left(\dfrac{1}{2}x\right)\right] = 2x$ , where $f(x)$ is differentiable function on $(-\infty, \infty)$.

Find $\dfrac{d}{dx}\left[f(x)\right]$.

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## QUESTION 6:

(9 Marks)

**a)** Find $\dfrac{dy}{dx}$ for each of the following:

1) $y = 2x^5 - 7$

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

3) $y = \sqrt{x^2 + 4x} + x^{\frac{2}{3}}$

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

5) $y = (x^2 + 3)(4x - 2)$

**b)** Find $f''(x)$ for $f(x) = x^4 + x^{-2}$

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*Good Luck*