United International University

School of Science and Engineering

Mid Term Examination Trimester: Summer-2023

Course Title: Fundamental Calculus

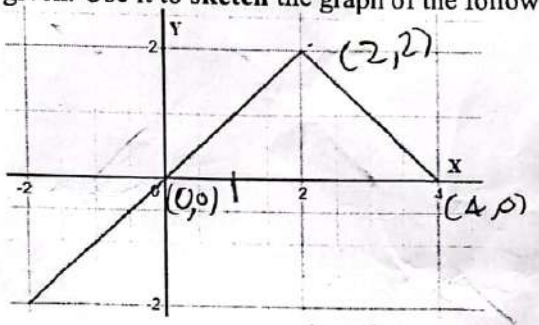
Course Code: Math 1151 Marks: 30 Time: 1 Hour 45 Mins

Answer all the questions. Answer all parts of a question together.

1. (a) **Draw** the graph of the following functions and **find** their domain and range. [6]

(i) $y = 3x - x^2$ (ii) $y = 2e^{-x} + 1$ (iii) $y = 3\sin 2x$

(b) The graph of $f(x)$ is given. Use it to **sketch** the graph of the following functions. [4]



(i) $2 - f(1 - x)$ (ii) $3\left|f\left(\frac{x}{2}\right)\right|$

2. (a) **Determine** whether the following functions are even, odd, or neither. **Explain** your reasoning. [2]

(i) $f(x) = x + |x|$, (ii) $g(x) = \frac{x}{x^2-3}$, (iii) $h(x) = x^3 - 1$, (iv) $k(x) = \frac{\sin x}{x}$

(b) Complete the accompanying table so that the graph of $y = f(x)$ is symmetric **(a)** about y axis, and **(b)** about origin. [2]

x	-6	-3	-1	1	3	6
$f(x)$	7		2		-5	

(c) **Determine** whether the following functions are one to one, or many to one. **Find** the inverse of each function (if possible). **Draw** the graph of each function and its inverse in the same diagram. Also, **state** the domain and range of the inverse function(s). [6]

(i) $f(x) = 2 + 5^{-x}$

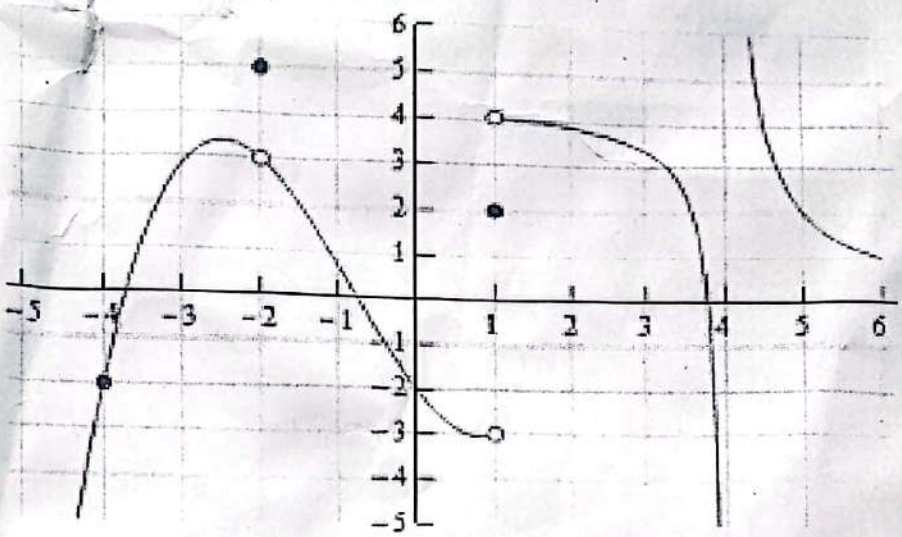
(ii) $f(x) = -\sqrt{3 - 2x}$

3. (a) **Sketch** the graph of $f(x)$. **Find** $f(-4)$ and $f(2)$. Also, **determine** whether the values of x at which $f(x)$ is discontinuous. [3]

$$f(x) = \begin{cases} -3; & x < -2 \\ x^3; & -2 \le x < 2 \\ x - 1; & x \ge 2 \end{cases}$$

Please Turn Over

(b) The graph of the function $y = f(x)$ is given. **[5]**



From the figure **write** the answers of the following questions:

(i) $\lim_{x \to -2^-} f(x)$ and $\lim_{x \to 4^+} f(x)$

(ii) $\lim_{x \to 1} f(x)$

(iii) $f(-2)$ and $f(0)$.

(iv) **Check** the continuity of $f(x)$ at $x = -4$ and 1. Explain.

(c) **Show that,** $y = |x + 2|$ is continuous at $x = -2$. **[2]**

BEST OF LUCK!!!