United International University

School of Science and Engineering

Mid Term Examination Trimester: Spring-2024

Course Title: Fundamental Calculus

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

Answer <u>all</u> the questions. Answer all parts of a question together.

1. **(a)** Use the graphs of the functions $f(x)$ and $g(x)$ in the accompanying figure to solve the following questions. **[5]**

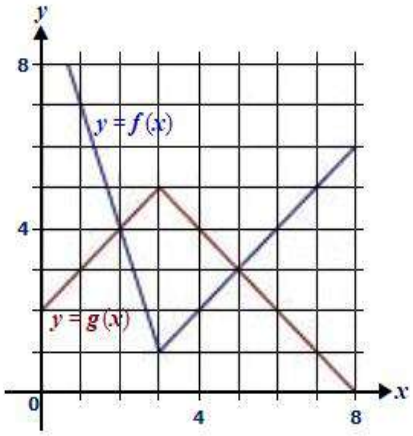
(i) **Find** the values of $f(6)$ and $g(1)$.

(ii) For what values of x is $f(x) = g(x)$?

(iii) On what interval(s) is $g(x) \leq 3$?

(iv) **State** the solution of the equation $f(x) = 4$.

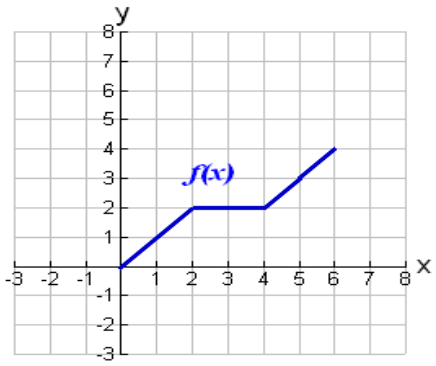
(v) **State** the domain and range of $g(x)$.



(b) **Find** the domain of the following functions. **[3]**

(i) $y = \frac{x^2+1}{x^3-25x}$ **(ii)** $y = \sqrt{9 - x^2}$

(c) The given graph of the function is defined for $x \geq 0$. **Complete** the graph for $x < 0$ to make it as **(i)** an odd function, and **(ii)** an even function. **[2]**



2. **(a)** **Draw** the graph of the following functions. **[4]**

(i) $y = 2 + \sqrt{3 - x}$ **(ii)** $y = \frac{1}{2}\cos 2x$

(b) **Find** the inverse function of $f(x) = 2 - e^x$. **[2]**

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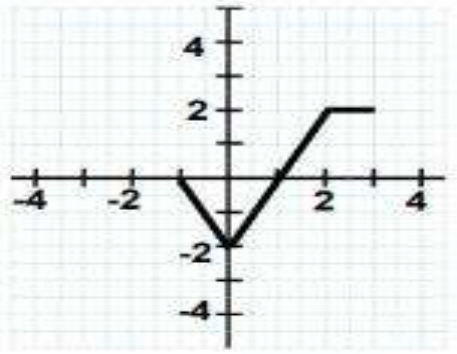
(c) The graph of $f(x)$ is given. Use it to **sketch** the graph of the following functions. **[4]**

(i) $y = 1 - f(x+1)$

(ii) $y = 2 + |f(-x)|$



3. **(a)** The graph of $f(x)$ is given. **[4]**

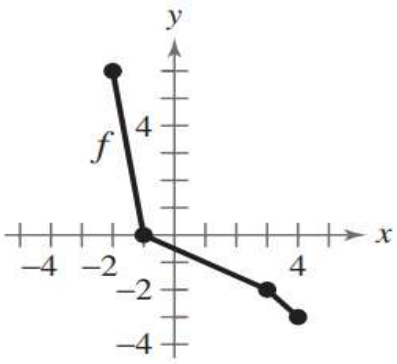
(i) **Determine** whether $f(x)$ is one to one function, or not.

(ii) **Complete** the following table.

x	-3	-2	0	6
$f^{-1}(x)$				

(iii) **Sketch** the graph of $f^{-1}(x)$ along with $f(x)$.

(iv) **What** is the domain and range of $f^{-1}(x)$?



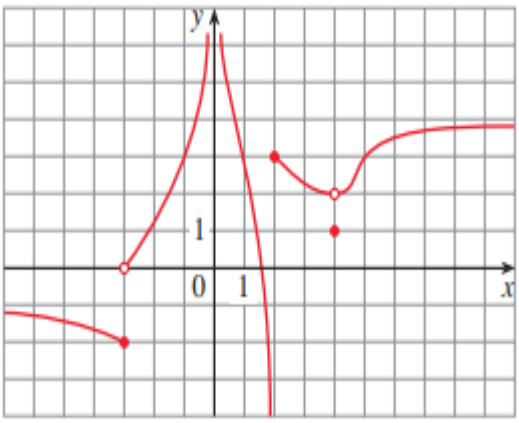
(b) The graph of the function $y = f(x)$ is given. From the figure **write** the answers of the following questions: **[4]**

(i) $\lim_{x \to -3^-} f(x)$ and $\lim_{x \to 0^+} f(x)$.

(ii) $\lim_{x \to 2} f(x)$.

(iii) Is $f(x)$ continuous at $x = 4$? **Explain** it.

(iv) **Write** the equation of a vertical and a horizontal asymptote of the function $f(x)$.



(c) **Sketch** the graph of $f(x)$ and **locate** the value(s) of x at which $f(x)$ is discontinuous. **[2]**

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