An Example of Midterm Exam -GEO1007

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Name:_____

Student ID:_____

Section:_____

Instructor:_____

- This is a closed-book, closed-notes exam. No calculators or other electronic aids will be permitted.
- In order to receive full credit, please show all of your work and justify your answer. You do not need to simplify your answers unless specifically instructed to do so.
- If you need extra room, use the back sides of each page. If you must use extra paper, make sure to write your name on it and attach it to this exam. Do not unstaple or detach pages from this exam.
- Please sign the following:

> "On my honor, I have neither given nor received any aid on this examination. I have furthermore abided by all other aspects of the honor code with respect to this examination."

Signature: _____

Score

Problem 1		Problem 13	
Problem 2		Problem 14	
Problem 3		Problem 15	
Problem 4		Problem 16	
Problem 5		Problem 17	
Problem 6		Problem 18	
Problem 7		Problem 19	
Problem 8		Problem 20	
Problem 9		Problem 21	
Problem 10		Problem 22	
Problem 11		Problem 23	
Problem 12		Total score	

Problem 1

(20 points)

(a) Characterize the following sets of numbers: natural numbers, whole numbers, integers, rational numbers, irrational numbers, and real numbers.

(b) Define absolute value.

(c) Define function.

(d) Define the composition of functions.

(e) State the formal definition of a limit.

Problem 2

(10 points) State whether the functions *f* and *g* below are equal.

a. $f(x) = \dfrac{3x^2 - 5x - 2}{x - 2}$; $g(x) = 3x + 1$

b. $f(x) = \dfrac{(3x + 1)(x - 2)}{x - 2}$, $x \neq 6$;

$g(x) = \dfrac{(3x + 1)(x - 6)}{x - 6}$, $x \neq 2$

Problem 3

(8 points) Classify the functions defined below as even, odd or neither.

a. $f_3(x) = \dfrac{1}{3x^3 - 4}$

b. $f_8(x) = |x| + 3$

Problem 4

(18 points) Determine f o g and its domain for the following functions.

(a) $f(x) = \sqrt{1-x^2}$ and $g(x) = 2x^2$

(b) $$f(x) = \begin{cases} 1+x & \text{jika } x \geq 0 \\ 1/x & \text{jika } x < 0 \end{cases}$$

$$g(x) = \begin{cases} \dfrac{x}{x-1} & \text{jika } x > 1 \\ 2x-1 & \text{jika } x \leq 1 \end{cases}$$

Problem 5

(10 points)

Suppose the total cost (in dollars) of manufacturing q units of a certain commodity is given by

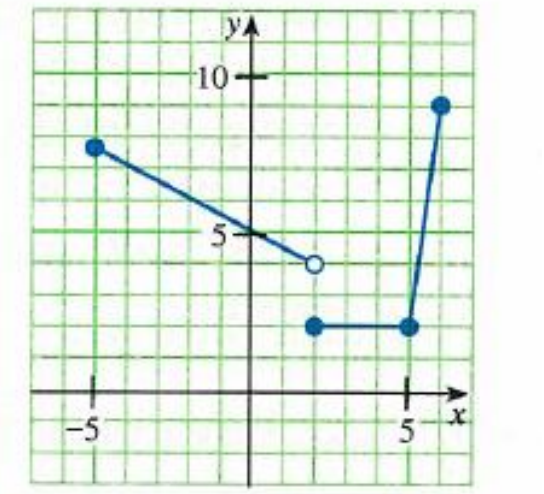
$$C(q) = q^3 - 30q^2 + 400q + 500 \text{ for } 0 \leq q \leq 30$$

a. Compute the cost of manufacturing 20 units.

b. Compute the cost of manufacturing the twentieth unit.

Problem 6

(8 points) Given the funtion *t* defined by the graph below. Find the limits indicated.



Graph of *t*

(a) $\lim_{x \to 2^+} t(x)$

(b) $\lim_{x \to 2} t(x)$

(c) $\lim_{x \to 4} t(x)$

(d) $\lim_{x \to -4} t(x)$

Problem 7

(20 points) Evaluate the limits.

(a) $\lim_{x \to \pi/2} \dfrac{2x - \pi}{\cos x}$

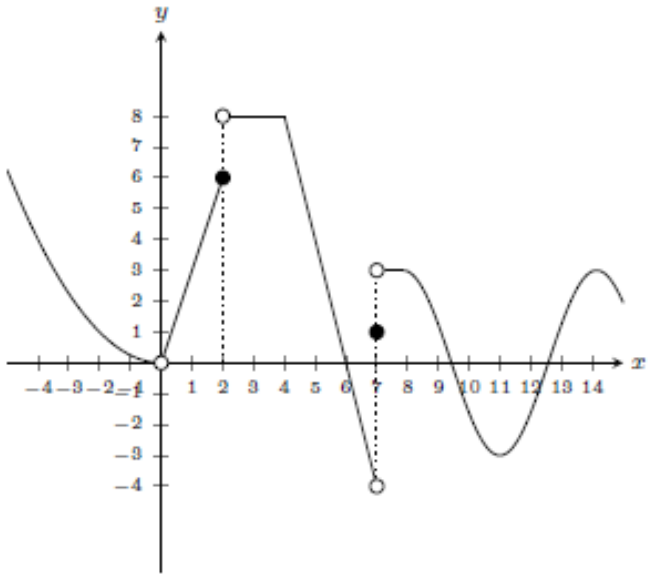
(b) $\lim_{x \to 3^+} \dfrac{\sqrt{x - 3} + x}{3 - x}$

(c) $\lim_{x \to 0} \dfrac{1 - \dfrac{1}{x + 1}}{x}$

(d) $\lim_{x \to 0} \left(x^2 - \dfrac{2^x}{2{,}000} \right)$

Problem 8

[**10 points**]The figure below shows part of the graph of a function f.



Using this figure, determine which of the following statements about f is false.

(A) $\lim_{x \to 0} f(x)$ exists.

(B) f is discontinuous at 2.

(C) It is continuous at 4.

(D) $\lim_{x \to 7} f(x)$ exists.

Answer: ☐

Problem 9

(15 points) Find the value of the constant k for which the following piecewise-defined function is continuous everywhere.

$$f(x) = \begin{cases} 7x + k & \text{if } x \leq 2; \\ 18 + kx & \text{if } x > 2. \end{cases}$$

Problem 10

(15 points)

Find constants a and b such that $f(2) = f(0)$ and f is continuous at $x = 1$.

$$f(x) = \begin{cases} ax + 3 & \text{if } x > 1 \\ 4 & \text{if } x = 1 \\ x^2 + b & \text{if } x < 1 \end{cases}$$

Problem 11

(12 points)

Determine whether the statement is true or false. If it is true, explain why. If it is false, explain why or give an example that disproves the statement.

1. If f is a function, then $f(s + t) = f(s) + f(t)$.
2. If $f(s) = f(t)$, then $s = t$.
3. If f is a function, then $f(3x) = 3f(x)$.
4. If $x_1 < x_2$ and f is a decreasing function, then $f(x_1) > f(x_2)$.
5. A vertical line intersects the graph of a function at most once.
6. If f and g are functions, then $f \circ g = g \circ f$.