Math 1120   **Calculus**   **Test 1.**

January 31, 2001   **Name** _____

The first 8 problems count 7 points each and the final 4 count as marked.

1. Fill in the three character code you received via email in the box [ ]

   Multiple choice section. Circle the correct choice. You do not need to show your work on these problems.

2. Which of the following numbers belong to the (implied) domain of

$$f(x) = \frac{\sqrt{x-2}}{x-4}?$$

   Circle all those that apply.

   (A) -2 **(B)** 2 **(C)** 3 **(D)** 4 **(E)** 5

3. What is the y-intercept of the line defined by $\frac{x}{3} + \frac{y}{6} = 2$?

   (A) -2 **(B)** 4 **(C)** 6 **(D)** 12 **(E)** 16

4. Let $f(x) = 2x + 3$ and $g(x) = 3x - 3$. Which of the following does not belong to the domain of f/g?

   (A) 1 **(B)** 3 **(C)** 6 **(D)** 9 **(E)** The domain of f/g is the set of all real numbers.

5. Referring to the f and g of the previous problem, what is the value of $g(f(g(3)))$?

   (A) -3 **(B)** 15 **(C)** 42 **(D)** 45 **(E)** 54

1

6. Let $f(x) = x^2 + 1$. Evaluate and simplify $\frac{f(x+h)-f(x)}{h}$.

   (A) $h - 2$ **(B)** $2x - 2h + h^2$ **(C)** $2x + h$

   (D) $2x + h + 2$ **(E)** $x^2 + 2h + 2$

   Suppose the functions f and g are given completely by the table of values shown.

x	$f(x)$	x	$g(x)$
0	2	0	5
1	7	1	7
2	5	2	4
3	1	3	2
4	3	4	6
5	6	5	3
6	0	6	1
7	4	7	0

7. Solve the equation $f \circ g(x) = 7$?

   (A) 1   **(B)** 3   **(C)** 4   **(D)** 5   **(E)** 6

8. Compute $(f \cdot g)(g(3))$?

   (A) 18   **(B)** 20   **(C)** 24   **(D)** 28   **(E)** 30

   On all the following questions, **show your work.**

9. (20 points) Let f and g be functions defined by $f(x) = \begin{cases} x^2 - 1 & \text{if } x < 0 \\ 4 - x & \text{if } x \geq 0 \end{cases}$
   and $g(x) = 2x + 3$.

   (a) Compute $g \circ f(-1)$, $g \circ f(0)$, and $g \circ f(1)$

   (b) Find a symbolic representation of $g \circ f(x)$

10. (10 points) Cowling's Rule can be used to calculate drug doses for children. If a is the adult dosage and t is the age of the child in years, then the child's dosage is

$$D(t) = \left(\frac{t+1}{24}\right) a.$$

   If the adult dosage for a certain drug is 300 mg and the child is 5 years old, how much drug should be prescribed?

11. (25 points) Compute each of the following limits.

(a) Let $f(x) = \begin{cases} x + 2 & \text{if } x \neq 1 \\ 1 & \text{if } x = 1 \end{cases}$

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

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

(c) $\lim\limits_{x \to 1} \dfrac{x - 1}{x^3 - 1}$

(d) $\lim\limits_{x \to 3} 2x^3 \sqrt{x^2 + 7}$

(e) $\lim\limits_{x \to \infty} \dfrac{2x^2}{1 + x^2}$

12. (15 points) Describe in English what it means to say that "the limit of a function f is 2 as x approaches 1". Sketch a graph of a function which has this property but also satisfies $f(1) = 3$.