

## CALCULUS 131: SAMPLE MIDTERM 1

*Problem 1* (10 points). Please answer true or false. You do not need to justify your answer.

- (1) The contrapositive of  $P \Rightarrow Q$  is  $Q \Rightarrow P$ .
- (2) The product of two irrational numbers is always irrational.
- (3) The sum of two odd functions is odd.
- (4) For every  $f$  and  $g$ ,  $f \circ g = g \circ f$ .
- (5) The function  $f(x) = |x| + 2$  is even.

*Problem 2* (8 points). Solve the inequality  $(x - 1)(x + 4) \leq 0$  and write its solution in interval notation.

*Problem 3* (8 points). Find the center and radius of the circle whose equation is  $x^2 - 2x + y^2 + 4x = 4$ .

*Problem 4* (14 points). Let  $f(x) = \sqrt{x} + 2$ , and  $g(x) = \frac{1}{x-1}$ .

- (1) Find the natural domains of  $f$  and  $g$ . (6 points)
- (2) Find the domain of  $f + g$  and find a formula for  $(f + g)(x)$ . (4 points)
- (3) Find the domain of  $f \circ g$  and a formula for  $(f \circ g)(x)$ . (4 points)

*Problem 5* (10 points). Let  $f(x) = \frac{x+2}{x-1}$ .

- (1) What is the natural domain of  $f$ ? (4 points)
- (2) Show that the natural domain of  $f \circ f$  is the same as that of  $f$ , and that  $(f \circ f)(x) = x$  for all  $x$  in this domain. (6 points)