

CALCULUS 131: MIDTERM 1

Please answer all questions in a blue book provided to you. Calculators are not allowed. The exam is worth 50 points with 5 possible bonus points.

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

- (a) If $Q \Rightarrow P$ is true, then $P \Rightarrow Q$ is true.
- (b) The sum of two irrational numbers is always irrational.
- (c) If $a < b$ then $a + c < b + c$ for all real numbers c .
- (d) If f is odd, then $f(0) = 0$.
- (e) $\sqrt{x^2} = x$ for all x .

Problem 2 (8 points). Solve the inequality $(x - 3)(x + 1) < 0$.

Problem 3 (10 points).

- (a) What is the equation of the circle with center $(-3, 2)$ and radius 4? (5 points)
- (b) Find the equation of the line that passes through the points $(-2, 11)$ and $(1, 5)$. Is $(2, 3)$ on the line? (5 points)

Problem 4 (22 points).

- (a) Solve the inequality $|x - 2| > 1$. (6 points)

$$\text{Let } f(x) = \frac{1}{\sqrt{x-1}} \text{ and } g(x) = |x - 2|.$$

- (b) Find the natural domains of f and g . (4 points)
- (c) Find the domain of $f + g$ and find a formula for $(f + g)(x)$. (4 points)
- (d) Find the domain of $f \circ g$ and the formula for $(f \circ g)(x)$. (*Hint: Use (a).*) (4 points)
- (e) Find the domain of $g \circ g$ and the formula for $(g \circ g)(x)$. (4 points)

Problem 5 (5 bonus points). Prove that the product of a rational number and an irrational number is irrational.