Name: _____

MATH 1271: CALCULUS I
SAMPLE MIDTERM TEST I

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You have to show all work! A correct answer with incorrect or no work shown will not be counted.

You may not use a calculator, notes, books, etc. Only the exam paper and a pencil or pen may be kept on your desk during the test.

Good luck!

Problem 1. Calculate the value of the following limits when they exist.

(1) $\lim_{x\to -5} \frac{x+5}{x^2-25} =$

(2) $\lim_{x\to \pi} \frac{\sin x}{x} =$

(3) $\lim_{x\to -\infty} \frac{3x}{1-2x^2} =$

(4) $\lim_{x\to 2^-} \frac{1}{(x-2)^3} =$

(5) $\lim_{x\to -1} \frac{5x}{(x+1)^2} =$

(6) $\lim_{x\to \infty} \frac{x}{x+\sin x} =$

(7) $\lim_{x\to \infty} \frac{x\sin x}{x+\sin x} =$

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Problem 2. Show that the polynomial $x^7 - 15x$ has at least three distinct real roots.

Problem 3. Find all values of b which make the following function continuous wherever it is defined:

$$f(x) = \begin{cases} |x|^b, & \text{if } x < 1, \\ 1, & \text{if } x \geq 1. \end{cases}$$

Problem 4. Calculate the derivative of $f(x) = x^3 + x$ at $x = 1$ using the definition of a derivative and find an equation of the tangent line to the graph $y = f(x)$ at the point $(1, 2)$.

Problem 5. A particle is moving along a coordinate axis. The position of the particle at time t is given by $s(t) = t^3 - 3t^2 + 3t - 129$. At what time(s) is the velocity zero?

Problem 6 (Bonus Question)**.** When a circular metal plate is heated, its radius increases at a rate of 0.01 cm/min. At what rate is the plate's area increasing when the radius is 50 cm?