Name: _____

MATH 1271: CALCULUS I
SAMPLE MIDTERM TEST II

INSTRUCTOR: ALEX VORONOV

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. Find the derivatives of the following functions:

(1) $\sin \ln(x^2)$;

(2) x^x;

(3) $\dfrac{\sin^2 x + \cos^2 x}{\sqrt{e^{-x}}}$;

(4) $\arcsin\left(\dfrac{1}{x}\right)$;

(5) the derivative $\dfrac{dy}{dx}$, if $2xy^2 + x^4 = y^3$.

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Problem 2. Find the twelfth derivative $f^{(12)}(x)$ of the function $f(x) = \ln x$.

Problem 3. (1) Find an equation of the tangent line to the graph of $f(x) = \sqrt{x^3 - 4}$ at the point where $x = 2$.

(2) Using the linear approximation or the differential, approximate

$$f(2.06) = \sqrt{2.06^3 - 4}$$

up to two decimal places, i.e., computing the two decimal places of the answer.

Problem 4. If $f(x) = g(3x^2)$ and $f(3) = 8$, $g(3) = -2$, $g(9) = 0$, $g(27) = 8$, $g'(3) = 5$, $g'(9) = -1$, $g'(27) = 2$, find $f'(3)$.

Problem 5. The volume of a cube is increasing at a rate of $10\text{cm}^3/\text{min}$. How fast is the surface area increasing, when the length of an edge is 30cm?

Problem 6. Find the local and absolute extreme values of the function $f(x) = x - \sqrt{x}$ on the interval $[0, 4]$.