

Quiz 3
Math 31–6429

You should fully justify your answers. Do all your work on separate paper, and make sure to *print* your name in the first sheet and staple all the sheets together. **Unstapled, loose pieces of paper will not be graded.** This quiz is due on Tuesday, October 2, at 6:00 pm.

1. Prove, using the definition of the derivative as a limit that

$$(x^4 - 3x)' = 4x^3 - 3.$$

2. Find an equation of the line tangent to the graph of $y = \frac{x^2 - 4}{x^2 + 3}$ at the point with $x = 0$.
3. Find the equations of all lines that are tangent to the graph of

$$y = \frac{x - 1}{x + 1}$$

and are parallel to the line $x - 2y = 5$.

4. Prove that the graph of the equation $y = x^5 + 4x^3 + 3x$ has no horizontal tangent line.
5. **Extra credit** Can you give an example of a function that has a tangent line at $x = 0$ but it is not differentiable at $x = 0$?