Name:_____

MA 1613 Section 51 *Practice Final Exam* *November 19, 2019*

Follow the instructions for each question and show enough of your work so that I can follow your thought process. If I can't read your work, answer or there is no justification to a solution, you will receive little or no credit!

For problems 1 and 2, sketch the graph of the function. That is classify all local extrema, absolute extrema, inflection points, find the intervals in which $f(x)$ is increasing/decreasing, concave up/down and find all horizontal, vertical, and slant asymptotes.

1. $f(x) = \dfrac{x^2 - 4}{x - 1}$

2. $f(x) = \dfrac{6}{x^2 - 1}$

3. Ranchers want to enclose a rectangular area near a river for their cattle. They have 240 yds of fencing available. What is the largest area that can be enclosed.

4. Of all the numbers whose difference is 4, find the two that have the minimum product.

For problems 5 and 6, differentiate implicitly to find y'.

5. $x^4y^3 - x^6y^9 = 20$

6. $3x^2y^8 + 4x^6y^3 = 29$

7. Two cars start from the same point at the same time. One travels north at 25 mph and the other travels east at 60 mph. How fast is the distance between them increasing at the end of 1 hr?

8. A ladder 26 ft long leans against a vertical wall. If the lower end is being moved away from the wall at a rate of 5 ft/sec, how fast is the height of the top changing when the lower end is 10 ft from the wall?

For problems 9 - 12, differentiate the function.
9. $y = xe^x - x^2e^{-6x} + x^6$

10. $y = 5xe^{x^2} + xe^{-9x} + 4x^2$

11. $f(x) = \ln\left(\dfrac{6x^3 - e^x}{x^3 + 2}\right)$

12. $f(x) = \dfrac{e^{3x}\ln(x^2+2)}{x+4}$

13. Show that

$$\frac{d}{dx}(\ln|x|) = \frac{1}{x}$$

for all $x \neq 0$.