

Math 2250
Practice exam 1

This is a practice exam only, to give you an idea of what kind of questions we will have - not to say that we will have exactly those -especially in number 2, and clearly I will have different functions in problems 5,6,7. Have fun with these

(15 pts) State the definition of derivative. Explain how we obtained this limit as product of the process of looking for a way to calculate the slope of a line tangent to the curve $y = f(x)$ at a point P on the curve. Write in full articulate sentences and draw the relevant picture(s).

2. (15 pts) Calculate the derivative of $f(x) = \frac{5x}{3x-2}$ directly from the definition.

2b. Check the calculation above using the rules of differentiation.

3. Evaluate each of the following limits. **Show all your work. Just a final answer is 0 points.**

a) (6pts) $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x^2 - 2x - 3}$

b) (6pts) $\lim_{x \rightarrow 3} \frac{\sqrt{x+1} - 2}{x - 3}$

c) (6pts) $\lim_{x \rightarrow \infty} \frac{1 - x^2 + 3x^3}{6x^3 - x^2 + 4}$

(d) (6pts) $\lim_{x \rightarrow 0} \frac{\sin 2x}{\sin 3x}$

4. (11 pts) A problem that is a mix of something like a HWT2.4A: Problem 2, problem HWT2.6: Problem 7 or something like HWT2.4A: Problem 7 or 8 or HWT2.6: Problem 8, involving domain, range, limits and continuity (including limits from left and right and continuity from left/right).
5. (10 pts) Find points of discontinuity of the function $f(x) = \frac{x^2 - 1}{x^2 - 2x - 3}$ and describe the behavior of the function near . Explain your answers and sketch the graph. (Hint you are supposed to look at limits from left and right at each of the points of discontinuity.)

6. Find the derivatives for functions given below. You can use the fact that if $f(x) = \sin x$ then $f'(x) = \cos x$.

a) (5 pts) $y = 3x^5 - 5x^2 + 7$

b) (5 pts) $y = \frac{x^2 - 1}{x^2 - 2x - 3}$

c) (5 pts) $y = x^2 \cdot \sin x$

7. (10 pts) Find the equation of the line tangent to the curve $y = x^3 + 2x$ at the point $(1, 3)$.

(BONUS) 1) Prove the product rule.