

Exam 1 Review

This is just a guide to help you study. I do not guarantee that anything will or will not be on the exam based on this guide.

Basics

Wednesday, September 22, 2021 in class. No books or notes or cell phones. You may use a scientific calculator. Sections covered 2.1-2.5, 3.1- 3.4

Practice Problems

- pg. 108 **Concept Check:** 1-4,6
- pg. 109 **Exercises:** 1, 2, 4-16, 19 (precise definition means ϵ, δ) 23, 24, 26
- pg. 196 **Concept Check:** 1-7, 8(a)-(f), 9
- pg. 197-199 **Exercises:** 2-8, 10, 11, 12ab, 15, 19, 42, 48, 52

Suggestions

- Work lots and lots of problems, especially those on material you don't understand as well. Try to solve problems without looking at the book for formulas or similar problems.
- When possible, ask yourself WHY you are solving a problem a certain way or WHY the result is true.
- Do not look at solutions unless you are desperate. It is much easier to read a correct solution than it is to figure it out yourself.
- Pay attention to details and check your work!!

Sample Problems

(1) Find an equation of the tangent line to the curve $f(x) = 3x + 2x^2$ at the point $x = 1$.

(2) Evaluate the limit, if it exists. Show or justify the steps you use.

(a) $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$

(b) $\lim_{h \rightarrow 2} \frac{h^2 - 3h - 4}{|3 - x|}$

(c) $\lim_{x \rightarrow -3} \frac{2h - 1}{x - 3}$

(3) Evaluate the limit of $\lim_{x \rightarrow 3} \sqrt{\frac{4x - 3 + x^2}{2x^2 + x + 1}}$ and justify each step by indicating the appropriate Limit Laws.

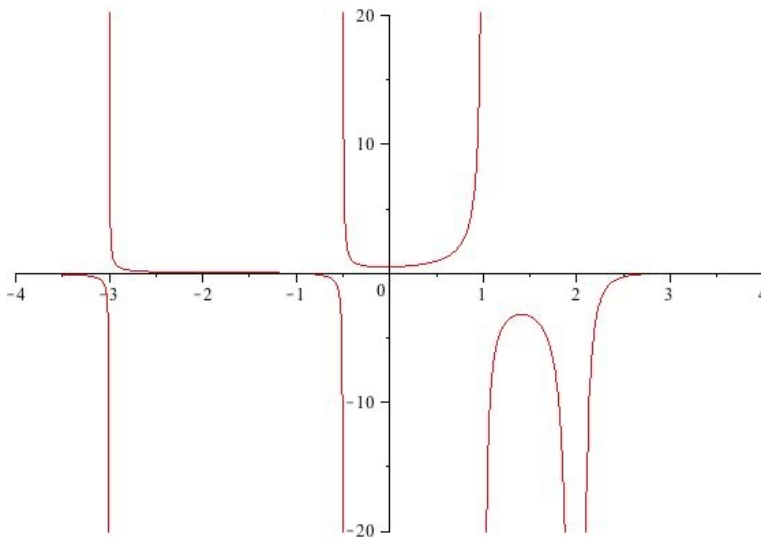
(4) Below is the graph of a function $f(x)$. State the following.

(a) $\lim_{x \rightarrow -3^-} f(x)$

(c) $\lim_{x \rightarrow 1} f(x)$

(b) $\lim_{x \rightarrow -3^+} f(x)$

(d) $\lim_{x \rightarrow 2} f(x)$

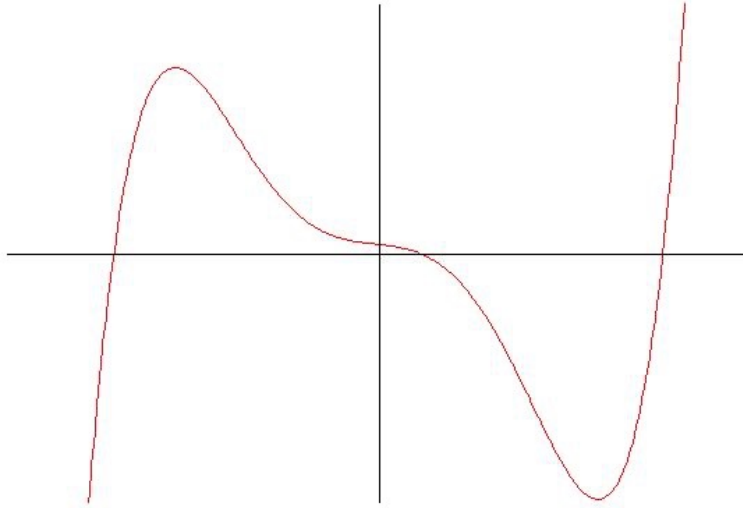


(5) Prove the following statement using the ϵ, δ definition of limit.

$$\lim_{x \rightarrow 3} 3x + 2 = 11$$

(6) Use the formal definition of the derivative to find $f'(x)$ for the function $f(x) = \frac{1}{2x + 1}$.

(7) Below is the graph of a function f . On the same graph sketch a rough graph of its derivative.



(8) Let $f(r) = \frac{r^2 + 2r - 3}{r^2 + r - 6}$.

(b) Compute $\lim_{r \rightarrow -3} f(r)$

(c) Determine the infinite limit $\lim_{r \rightarrow 2^-} f(r)$.

(9) Differentiate the following functions.

(a) $f(x) = 1 - 3x + 2x^3$

(b) $g(t) = 5t^2 - \frac{2}{t}$

(c) $f(x) = \frac{1+x}{x^2}$

(d) $f(x) = x \cdot \cos(x)$