PRACTICE EXAM 1: PRECALCULUS, FALL 2020 - NEWTON

Instructions. You may work on this exam on your own time, using any resource you like (open notes, open book, open Internet). However, you still need to understand the material yourself, even if you are looking up some things. You need to show all your work and explain your solutions fully in order to get full credit. Copying from the book without understanding is not enough, and many internet solutions are outright wrong (looking at you, Slader). You won't need a calculator, since you don't have to simplify your numerical answers.

Your work on this exam should be your own. I can't prevent you from working with other students, but know that it is pretty obvious to me when you do. Pure copying from other students might get you both a zero, and most of the time when you do this, both solutions are totally wrong anyway.

When the question asks for an explanation of the work or your process, that means you should give an explanation in words, in addition to the mathematical work you showed to get to the answer. However, this isn't an English test, I don't care about whether it's a complete sentence, or whether you mispelled something, had bad grammar, etc. As long as you give some sort of correct explanation in words, it will be fine.

Good luck! Do your best! You'll do great.

(1) Solve the absolute value inequality $2|x-7|-4 \geq 42$ for x. Show each step of your work for full credit.

(2) For each year t, the population of a forest of trees is represented by the function $A(t) = 115(1.025)^t$. In a neighboring forest, the population of the same type of tree is represented by the function $B(t) = 82(1.029)^t$. Which forest will have a greater number of trees after 20 years? By how many? Show how you got the answer for full credit.

(3) Let $f(x) = \frac{x^2+2x+1}{x^2+100}$. What is the domain of f? Find the y intercept and zeroes of f and their multiplicities. What are the vertical and horizontal asymptotes of f? Show your work to get to each answer. For each zero of f, explain whether the function crosses the x-axis or only touches and bounces off, and explain why.

(4) Let $f(x) = 4\sqrt{x} + 2$. What is the domain of f? Is f one-to-one? If so, find the inverse of f, $f^{-1}(x)$. Describe how the graph of $f(x)$ is related via transformations to the graph of $g(x) = \sqrt{x}$ (you can do this by graphing it, or you can just describe the transformations in words). Find the average rate of change of f from $x = 0$ to $x = 1$. Is it positive or negative? Based on what you know about the function and its graph, does that answer make sense?

(5) Let $f(x) = \sqrt{x+1}$ and $g(x) = x^2$. Find $f(g(x))$. Find the inverse function of $f(x)$, find the inverse function of $g(x)$, and find the inverse function of $f(g(x))$. Is the inverse function of $f(g(x))$ related to the inverse of f and g alone, and if so, how?

(6) Let $f(x) = x^2 + 4x + 4$.What is the domain of f? Find the y intercept of f, and find the zeroes of f and their multiplicities. Does f have a minumum or maximum, and if so, where is the absolute min/max? What is the end behavior of f? (You can either show the end behavior on a graph, or by explaning in words.)