

PRACTICE EXAM 2: 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. 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 or missing information and explanations. Please avoid using a calculator. You won't need one, since you don't have to simplify your numerical answers. **Leave your answers exact, do not convert to decimal** (as in, leave things with the square roots, fractions, e , π).

Your work on this exam should be your own. Working with other students can get you both a zero. Trust and believe in yourself over other students and the internet.

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 misspelled 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) Let $f(x) = 2e^{x+1} + 1$. Is f a growing or decaying exponential? What is the domain and range of f ? What are the x and y intercepts of f , if any? What are the asymptotes of f , if any? What is the inverse function of f , and its domain and range?

- (2) Find all x values such that $\log_{12}(2x + 6) + \log_{12}(x + 2) = 2$.

(3) Verify the identity: $\cos(x + y) + \cos(x - y) = 2 \cos(x) \cos(y)$.

- (4) You are purchasing a phone charger that you want to run from the outlet near the floor to your desk 3 feet off the ground. The outlet is 4 feet away from the bottom of your desk. How long does the charger cable have to be, at minimum? What angle will the charger make with the surface of your desk? (Do you think that will be okay for charging your phone?)

(5) Simplify the expression: $\tan^{-1}\left(\sin\left(\frac{2}{x^2}\right)\right)$.

- (6) Let $f(x) = 5 \cos\left(\frac{\pi}{4}x - \pi\right) + 2$. Find the period, amplitude, midline, and horizontal shift (both how far it is shifted, and which direction) of $f(x)$.

(7) Solve the equation $\sin^2(x) - \cos^2(x) - \sin(x) = 0$ for $x \in [0, 2\pi)$.

- (8) Convert the equation to polar coordinates: $9xy = 1$. What are some possible values of r and θ that could satisfy the equation?