

FINAL EXAM - TRIGONOMETRY - SPRING 2021 - NEWTON

Instructions. You may work on this exam on your own time, using any resource you like (open notes, open book, open Internet). Please do not post the questions online. I will check if the questions have been posted, and solutions matching those online solutions will receive a zero. 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. 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) Write the equation $x^2 + y^2 = 2y$ in polar coordinates, showing and explaining all your work. Graph the equation using polar coordinates.

- (2) Solve the equation for $0 \leq \theta \leq 2\pi$: $\frac{\sin(2\theta)}{\cos(\theta)} + \sin^2 \theta = -1$.

- (3) Consider the complex number $z = \frac{6-2i}{3i}$. Simplify z , showing and justifying all your work. Graph z . Find the absolute value and argument of z , and write z in trigonometric form (your answer can be in terms of an inverse trig function).

- (4) Suppose a triangle has side lengths $a = 5\text{cm}$, $b = 2\text{cm}$, and $c = 4\text{cm}$. Find all the angles in the triangle. (Your answer can have inverse trig functions, but should be fully simplified and exact.)

- (5) Let $\vec{u} = \langle -1, 1 \rangle$ and $\vec{v} = \langle 2, -2 \rangle$. Find unit vectors in the direction of \vec{u} and \vec{v} . What is the angle between \vec{u} and \vec{v} ?