PHYS 3200 - Fall 2025

End of Topic Quiz 5

October 28th, 2025

Name and ID #:

Instructions:

1. You may use:
   - A calculator that has no internet connection, and no stored reference material. Connecting to the internet or using reference material other than that provided on the equation sheet is cheating and you will fail the exam if you do so.
   - Notes.
   - Writing utensil: pencil and eraser are best.
2. Always start word problems with a drawing of the situation.
3. If you have a question about a problem (confused about the situation, need some missing piece of information, etc.), please raise your hand and ask!
4. $\boxed{\text{Box your final answer}}$ for each part.
5. Credit will not be given if your answers are too messy or obscure to read. Remember - a grader who isn't squinting and spending extra time trying to decipher mysterious scratches is a happy grader.
6. This quiz must be turned in by the end of the class period.

1. Prove that the shortest path between two points in the $x - z$ plane is a straight line following $z = mx + b$

2. A light ray travels in the $x - z$ plane through a medium where the refractive index varies continuously with height according to:

$$n(z) = n_0(1 + \beta z)$$

Where n_0 and β are positive constants and z is measured upwards.

(a.) Following the form $\int_1^2 n(z)ds$ define ds.

(b.) What is the 'function' that can minimize the previous integral? (What is $F(z, z', x)$?)

(c.) Write down the Euler-Lagrange equation for this system.