MATH 2551-GT-E– Multivariable Calculus **Summer 2025**

Full name: Key **GT ID:** **Sec:**

Quiz 9 Version B

You have 15 minutes to take the quiz. No phones, notes, or use aids of any kind is permitted.

1. (4 points) **[Line Integrals of Scalar Functions]** *True or False.*

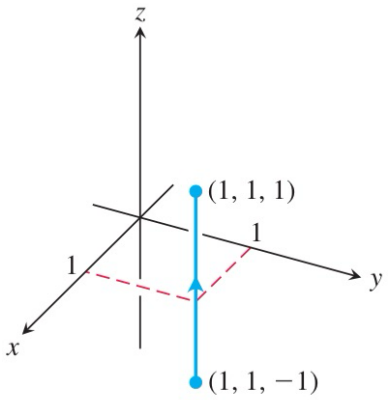
   (a) If $r_1(t)$, $t \in [0,1]$ is a parametrization of a curve C, then $r_2(t) = r_1(1-t)$, $t \in [0,1]$, is also a parametrization of C but with opposite orientation. [A]

   ● **TRUE** ○ **FALSE**

   (b) Find a parameterization for space curve C which is the line segment from $(-1,-1,-1)$ to $(1,1,1)$ shown in the image. [AN]

$r(t) = \langle 1, 1, -1+t \rangle$

$t \in [0,2]$



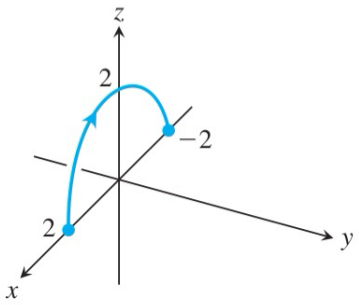
2. (6 points) **[Line Integrals of Scalar Functions]**
   Evaluate the line integral where C is the the half circle with radius 2 in the xz-plane with $z \geq 0$. [AJN]

$$A = \int_C \sqrt{x^2+z^2}\, ds, \quad C: \ \mathbf{r}(t) = \langle 2\cos t, 0, 2\sin t \rangle, t \in [0,\pi].$$

$r(t) = \langle 2\cos t, 0, 2\sin t \rangle$

$r'(t) = \langle -2\sin t, 0, 2\cos t \rangle$

$|r| = \sqrt{4\sin^2 t + 4\cos^2 t} = 2$



So

$$A = \int_0^{\pi} \sqrt{4\cos^2 t + 4\sin^2 t} * 2 \, dt$$

$$= \int_0^{\pi} 4 \, dt = 4t \Big|_0^{\pi} = \boxed{4\pi}$$