

A curve C is given by a vector function $\mathbf{r}(t)$, $5 \leq t \leq 7$, with unit tangent $\mathbf{T}(t)$, unit normal $\mathbf{N}(t)$, and unit binormal $\mathbf{B}(t)$. Indicate whether the following line integrals are positive, negative, or zero by typing P, N, or Z as appropriate:

- A. $\int_C \mathbf{T} \cdot d\mathbf{r} =$ _____
- B. $\int_C \mathbf{N} \cdot d\mathbf{r} =$ _____
- C. $\int_C \mathbf{B} \cdot d\mathbf{r} =$ _____

11.(1 pt)

Suppose that $\iint_D f(x, y) \, dA = 1$ where D is the disk $x^2 + y^2 \leq 4$. Now suppose E is the disk $x^2 + y^2 \leq 64$ and $g(x, y) = 1f(\frac{x}{4}, \frac{y}{4})$. What is the value of $\iint_E g(x, y) \, dA$?

12.(1 pt)

A lattice point in the plane is a point (a, b) with both coordinates equal to integers. For example, $(-1, 2)$ is a lattice point but $(1/2, 3)$ is not. If $D(R)$ is the disk of radius R and center the origin, count the lattice points inside $D(R)$ and call this number $L(R)$. What is the limit, $\lim_{R \rightarrow \infty} \frac{L(R)}{R^2}$?