

MATH 1100-A 2008 Quiz 17
March. 3, 2009
Sections 7.5, 7.8.

Evaluate

1. (3 pts)

$$\int \frac{1}{x^2 + 4x + 5} dx$$

Solution:

$$\begin{aligned} & \int \frac{1}{x^2 + 4x + 5} dx \\ &= \int \frac{1}{(x+2)^2 + 1} dx \end{aligned}$$

Let $u = x + 2$, $du = dx$.

$$\begin{aligned} &= \int \frac{1}{u^2 + 1} du \\ &= \arctan u + C \\ &= \arctan(x + 2) + C. \end{aligned}$$

□

2. (2 pts)

$$\int_1^{\infty} \frac{1}{x \ln x} dx$$

Solution:

$$\begin{aligned} & \int_1^{\infty} \frac{1}{x \ln x} dx \\ &= \lim_{t \rightarrow \infty} \int_1^t \frac{1}{x \ln x} dx \end{aligned}$$

Let $u = \ln x$, $du = \frac{1}{x} dx$.

$$\begin{aligned} &= \lim_{t \rightarrow \infty} \int_1^{\ln t} \frac{du}{u} \\ &= \lim_{t \rightarrow \infty} [\ln u]_1^{\ln t} \\ &= \lim_{t \rightarrow \infty} (\ln(\ln t) - 0) \\ &= \lim_{t \rightarrow \infty} \ln(\ln t) = \infty \end{aligned}$$

The integral is divergent.

□