

Quiz 4RM Solutions

Please inform your TA if you find any errors in the quiz solutions.

1. (4 points)

1. (2 points) Find a value of a so that for all $x < a$ with $x > 2$

$$\frac{1}{\sqrt{x-2}} < \frac{1}{x-2}.$$

Solution: Any value of a with $2 < a \leq 3$ works.

2. (2 points) True or false: for all $x > 0$

$$\frac{\sqrt{1+x}}{x} > \frac{1}{\sqrt{x}}.$$

Solution: True.

2. (6 points)

Compute $\int \frac{e^{4x}}{\sqrt{1+e^{8x}}} dx$.

Solution:

$$\begin{aligned} & \int \frac{e^{4x}}{\sqrt{1+e^{8x}}} dx \\ &= \frac{1}{4} \int \frac{1}{\sqrt{u^2+1}} du && u = e^{4x} \quad \frac{1}{4} du = e^{4x} dx \\ &= \frac{1}{4} \int \frac{\sec^2(\theta)}{\sqrt{\tan^2(\theta)+1}} d\theta && u = \tan(\theta) \quad du = \sec^2(\theta) d\theta \\ &= \frac{1}{4} \int \sec(\theta) d\theta \\ &= \frac{1}{4} \ln |\sec(\theta) + \tan(\theta)| + C \\ &= \frac{1}{4} \ln |\sqrt{u^2+1} + u| + C && \arctan(u) = \theta \\ &= \frac{1}{4} \ln |\sqrt{1+e^{8x}} + e^{4x}| + C \end{aligned}$$