

Quiz 4 – Math 2153, Calculus II – Sept. 16, 2011

1. Evaluate the improper integral

$$\int_2^3 \frac{1}{\sqrt{3-x}} dx$$

Solution This is an improper integral of type 2. We have

$$\int_2^3 \frac{1}{\sqrt{3-x}} dx = \lim_{t \rightarrow 3} \int_2^t \frac{1}{\sqrt{3-x}} dx$$

Set $u = 3 - x$, we have $du = -dx$ and

$$\int \frac{1}{\sqrt{3-x}} dx = \int \frac{-1}{\sqrt{u}} du = -2\sqrt{u} + C = -2\sqrt{3-x} + C$$

Therefore,

$$\begin{aligned} \lim_{t \rightarrow 3} \int_2^t \frac{1}{\sqrt{3-x}} dx &= \lim_{t \rightarrow 3} (-2\sqrt{3-x}) \Big|_2^t \\ &= \lim_{t \rightarrow 3} (-2\sqrt{3-t} + 2\sqrt{3-2}) \\ &= 0 + 2 = 2 \end{aligned}$$