

Quiz 17

April 1, 2016

Evaluate the following double integrals and round to 3 decimal places.

$$\begin{aligned} 1. \int_0^1 \int_x^1 x - y \, dy \, dx &= \int_0^1 \left[xy - \frac{1}{2}y^2 \right]_{y=x}^{y=1} dx \\ &= \int_0^1 \left(x - \frac{1}{2} \right) - \left(x^2 - \frac{1}{2}x^2 \right) dx \\ &= \int_0^1 x - \frac{1}{2} - \frac{1}{2}x^2 dx \\ &= \left. \frac{1}{2}x^2 - \frac{1}{2}x - \frac{1}{6}x^3 \right|_0^1 = -\frac{1}{6} \approx \boxed{-.167} \end{aligned}$$

$$\begin{aligned} 2. \int_1^2 \int_0^{\ln x} x^4 \, dy \, dx &= \int_1^2 \left[x^4 y \right]_{y=0}^{y=\ln x} dx \\ &= \int_1^2 x^4 \ln x \, dx \quad \begin{array}{l} u = \ln x \quad dv = x^4 dx \\ du = \frac{1}{x} dx \quad v = \frac{1}{5}x^5 \end{array} \\ &= \left[\frac{1}{5}x^5 \ln x - \int \frac{1}{5}x^4 dx \right]_1^2 \\ &= \left[\frac{1}{5}x^5 \ln x - \frac{1}{25}x^5 \right]_1^2 \\ &= \frac{1}{5}(2)^5 \ln 2 - \frac{1}{25}(2)^5 - \left(0 - \frac{1}{25} \right) \\ &= 3.196 \end{aligned}$$