Week 7 Worksheet

1. Polar Coordinates

Evaluate the following integrals:

(a) $\int_{\sqrt{2}}^{2}\int_{\sqrt{4-y^2}}^{y} dx\,dy$

(b) $\int_{1}^{2}\int_{0}^{\sqrt{2x-x^2}} \frac{1}{(x^2+y^2)^2}\,dy\,dx$

(c) $\int_{-1}^{1}\int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \frac{2}{(1+x^2+y^2)^2}\,dy\,dx$

2. Triple Integrals

2.1 Evaluate the integral:

$$\int_0^1\int_1^{\sqrt{e}}\int_1^e se^s \ln r \frac{(\ln t)^2}{t}\,dt\,dr\,ds$$

2.2 Evaluate the integral:

$$\int_0^{\sqrt{2}}\int_0^{3y}\int_{x^2+3y^2}^{8-x^2-y^2} dz\,dx\,dy$$

3. Look Ahead: Cylindrical Coordinates

Evaluate the following integral:

$$\int_0^{2\pi}\int_0^1\int_{-1/2}^{1/2}(r^2\sin^2\theta+z^2)\,dz\,r\,dr\,d\theta$$