Note ♯5: Sections 15.1-15.3

Problem 1. (a) Evaluate $\int_{-3}^{3}\int_{0}^{\pi/2}\left(y+y^2\cos x\right)dxdy$.

(b) Evaluate $\iint_R \frac{x}{y^2}dA$, where $R=[0,4]\times[1,2]$.

(c) Evaluate $\int_0^2\int_0^{\pi}(y\cos(xy))dydx$.

Problem 2. Find the volume of the solid S that is bounded by the paraboloid $x^2+y^2+z=16$, $z=0$, $0\le x\le 4$, $0\le y\le 4$.

Problem 3. Evaluate $\int_1^4\int_1^{\sqrt{x}}(x+y)dydx$.

Problem 4. Evaluate $\iint_D xe^y dA$, where D is the region bounded by $y=0$, $y=x^2$ and $x=2$.

Problem 5. Find the volume of the solid under the surface $z=xy$ and above the triangle with vertices $(1,1),(1,2)$ and $(2,1)$.

Problem 6. Set up but do not evaluate $\iint_D ye^x dA$ in two different iterated integrals, where D is the triangular region with vertices $(0,0),(1,1)$ and $(2,0)$.

Problem 7. (a) Change the order of integration in $\int_0^4\int_{\sqrt{y}}^2 f(x,y)dxdy$.

(b) Evaluate $\int_0^2\int_x^2 e^{-y^2}dydx$.

(c) Evaluate $\int_0^2\int_{y^2}^4\sqrt{x}\sin x dxdy$.

Problem 8. Evaluate $\iint_R (x+2)dA$, where R is the region bounded by the circle $x^2+y^2=4$.

Problem 9. Set up but do not evaluate $\iint_R 4ydA$, where R is the region in the second quadrant bounded by the circles $x^2+y^2=1$ and $x^2+y^2=4$.

Problem 10. Evaluate $\iint_R 3x^2dA$, where R is the region in the first quadrant enclosed by the circle $x^2+y^2=9$ and the lines $y=0$ and $y=x$.

Problem 11. (a) Change $\int_0^3\int_0^{\sqrt{9-x^2}} x^2dydx$ to polar coordinates. Do not evaluate the integral.

(b) Change $\int_0^4\int_0^{\sqrt{4x-x^2}}\sqrt{x^2+y^2}dydx$ to polar coordinates. Do not evaluate the integral.

Problem 12. Set up but do not evaluate an integral that gives the volume of the solid that lies above the xy-plane, below the sphere $x^2+y^2+z^2=81$ and inside the cylinder $x^2+y^2=4$ in polar coordinates.

Problem 13. Find the volume of the solid bounded by the paraboloids $z=20-x^2-y^2$ and $z=4x^2+4y^2$.