Iterated Integrals

For problems 1 – 3 evaluate the following integrals.

1. $\int_{1}^{-2}\int_{0}^{1} x^3 y^4 \mathbf{e}^{x^2 y^5}\,dydx$

2. $\iint\limits_{R} 6y\cos^2\left(4x\right)+\dfrac{12y^3x^2}{y^4+2}\,dA, \qquad R=\left[-1,0\right]\times\left[0,3\right]$

3. $\iint\limits_{R} x\sin\left(4y-x\right)dA, \qquad R=\left[-2,0\right]\times\left[0,3\right]$

Double Integrals over General Regions

For problems 4 – 6 evaluate the following integrals.

4. $\int_{0}^{2}\int_{2x+1}^{x^3} 3+20y^3\,dy\,dx$

5. $\iint\limits_{D} y^4\mathbf{e}^{2+x^4}\,dA, \qquad D=\left\{\left(x,y\right)\,|\,0\le y\le\sqrt[5]{x^3},1\le x\le 2\right\}$

6. $\iint\limits_{D} \sin\left(1+\ln\left(x\right)\right)dA, \qquad D$ is the region bounded by $y=\frac{1}{x},\ y=0,\ x=1$ and $x=3$

7. Evaluate $\iint\limits_{D} 24y^2\,dA$ where *D* is the triangle in the *xy*-plane with vertices (0,0), (0,8) and (6,2) in the order given,

(a) Integrate with respect to ***y*** first and then ***x*.**

(b) Integrate with respect to ***x*** first and then ***y***.

8. Find the volume behind $x=1+y^2+4z^2$ and in front of the region in the *yz*-plane bounded by $y=3z$ and $y=6\sqrt{z}$.

Note that we probably only looked at the volume under a function in the form $z=f\left(x,y\right)$ and above a region in the *xy*-plane. However, you can take that knowledge and modify it appropriately to arrive at a formula/method for working this problem.

Continued on Back $\Rightarrow$

For problems 9 and 10 evaluate the integral by reversing the order of integration.

9. $\int_{-2}^{0}\int_{x}^{-x} 12x^2 y^4 \, dy \, dx$

10. $\int_{0}^{3}\int_{y^4}^{81} y^{11}\left(1+x^4\right)^{\frac{3}{2}} \, dx \, dy$

11. Evaluate $\iint\limits_D x\left(1-4y\right)dA$ where D is the triangle with vertices (0,0), (0,-3) & (3,-3) and the triangle with vertices (0,0), (-3,0) & (-3,3). See the sketch below.