Double Integrals in Polar Coordinates

For problems 1 & 2 evaluate the integral over the given region.

1. $\iint\limits_D 4xy^2\,dA$, *D* is the region between $x^2+y^2=4$ and $x^2+y^2=1$ and in the 3rd quadrant.

2. $\iint\limits_D \frac{1}{\sqrt{2x^2+2y^2+1}}\,dA$, *D* is the disk given by $x^2+y^2=2$.

3. Find the volume of the solid that is bounded by $y=7-4x^2-4z^2$ and $y=2x^2+2^2-5$. Note that you will have to use a *modified* version of polar coordinates to do this problem.

4. Use a double integral to derive the formula for the area of a circle of radius *a*.

5. Evaluate $\int_{-2}^{0}\int_{-\sqrt{4-y^2}}^{\sqrt{4-y^2}} \sqrt{x^2+y^2}\,dx\,dy$ by converting the integral into polar coordinates.

Triple Integrals

For problems 6 – 9 evaluate the given integral.

6. $\int_{1}^{-2}\int_{0}^{x^2}\int_{-y}^{y} y\mathbf{e}^{x^7}\,dz\,dy\,dx$

7. $\iiint\limits_E 36z\,dV$ where *E* is the solid bounded by the planes $5x+2y+z=10$, $x=0$, $y=0$, and $z=0$. In other words *E* is the solid that lies beneath $5x+2y+z=10$ and in the first octant.

8. $\iiint\limits_E 4z\,dV$ where *E* is the solid that lies between $2x+6y+5z=30$ and $4x+y+z=4$ and is in front of the region in the *yz*-plane bounded by $z=y^2$ and $z=\sqrt{y}$.

9. $\iiint\limits_E yz\,dV$ where *E* is the solid that is behind $x=5-2y^2-2z^2$ and in front of $x=y^2+z^2-7$.

10. Use a triple integral to find the volume of the solid *E* used in problem 8.

Triple Integrals with Cylindrical Coordinates

For problems 11 – 13 you must use cylindrical coordinates to do the problem.

11. $\iiint\limits_E x\,dV$ where *E* is the solid that lies inside $y^2+z^2=16$, in front of $x=4-y^2-z^2$ and behind $x=5$.

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12. Find the volume of the solid *E* that is inside $x^2+y^2=1$ below $z=\sqrt{x^2+y^2}$ and above $z=-\sqrt{3x^2+3y^2}$.

13. Use a triple integral to find a formula for the volume of a cylinder of radius *a* and height *h*.