Math 2415 **Homework Set 6** **10 Points**

Double Integrals in Polar Coordinates

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

1. $\iint\limits_D 48xy^3\,dA$, *D* is the region between $x^2+y^2=4$ and $x^2+y^2=36$ and to the right of the *y*-axis.

2. $\iint\limits_D \mathbf{e}^{4x^2+4y^2-3}\,dA$, *D* is the disk of radius 5 centered at the origin.

3. Find the volume of the solid that is bounded by $x=15-5y^2-5z^2$ and $x=2y^2+2z^2+1$. 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 $\int_0^4\int_{-\sqrt{16-x^2}}^0 \sin\left(1-x^2-y^2\right)dy\,dx$ by converting the integral into polar coordinates.

Triple Integrals

For problems 6 – 9 evaluate the given integral.

6. $\int_1^3\int_{\sqrt{z}}^0\int_0^{-2} y^2x^3\mathbf{e}^{z^3}\,dy\,dx\,dz$

7. $\iiint\limits_E 32z\,dV$ where *E* is the solid bounded by the planes $10x+5y+2z=10$, $x=0$, $y=0$, and $z=0$. In other words *E* is the solid that lies beneath $10x+5y+2z=10$ and in the first octant.

8. $\iiint\limits_E 36y\,dV$ where *E* is the solid that lies between $4x+3y+2z=12$ and $x+3y+3z=21$ and is in front of the triangle in the *yz*-plane with vertices (0,0), (2,0) and (2,4) – these are in the form (*y*,*z*).

9. $\iiint\limits_E \sqrt{2x^2+2z^2}\,dV$ where *E* is the solid that is in behind $y=8-3x^2-3z^2$ and in front of $y=-4$.

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. $\iiint\limits_E x^2\,dV$ where *E* is the solid that lies inside $x^2+y^2=16$, above $z=-\sqrt{4x^2+4y^2}$ and below $z=8x^2+8y^2$

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12. Find the volume of the solid *E* that is bounded by $y = 3x^2 + 3z^2 - 24$ and $y = 12 - x^2 - z^2$.

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