

Math 233 - November 17, 2009

- Exam 3: 8.1-10.1

1. Find the work done by the vector field $F = (2e^y, xe^y, (z+1)e^z)$ from the point $(0, 0, 0)$ to $(1, 1, 1)$.
2. Find the volume of the solid under the plane $z = x$ and above the region in the xy plane bounded by the $y = x$ and $y = x^2$.
3. Find the volume inside the sphere $x^2 + y^2 + z^2 = 25$ and outside the cylinder $x^2 + y^2 = 9$.
4. Find the volume of the solid bounded by $z = 40 - x^2 - y^2$ and $z = 8 + x^2 + y^2$.
5. Convert the equation $x^2 + 2y^2 = 1$ to polar coordinates.
6. Set up (but do not work out) an integral for the volume of the solid bounded by $z = x^2 + y^2$ and $z = 1 - y^2$. (See if you can write the integral in both rectangular and polar coordinates.)
7. Compute $\int_0^1 \int_y^1 e^{x^2} dx dy$
8. Compute $\int_{-1}^1 \int_0^{\sqrt{1-x^2}} x^2(x^2 + y^2)^2 dy dz$
9. Find the volume of the solid in the first octant bounded by the planes $y = 0$, $z = 0$, $x + y = 2$ and the cylinder $y^2 + z^2 = 1$.
10. Find the volume of the tetrahedron bounded by the coordinate planes and $3x + 8y + 4z = 24$.
11. Set up the integral $\iint_R f(x, y) dA$ where R is the region between the curves $y = x$ and $x = y^2 - y$
12. Find $\iint_D 4x + 2 dA$ where D is the region in the xy -plane bounded by the curves $y = x^2$ and $y = 2x$.
13. Find the volume of the solid in the first octant bounded by $z = 9 - y^2$, $x = 0$ and $x = 2$.
14. Find $\iint_D x^2 e^{xy}$ where D is the triangle in the xy -plane with vertices $(0, 0)$, $(1, 0)$ and $(1, 1)$.
15. Find the volume of the solid bounded by the paraboloid $z = x^2 + y^2 + 4$, the cylinder $x^2 + y^2 = 4$ and the plane $z = 0$.
16. Find $\iint_R xy dA$ where R is the unit disc $x^2 + y^2 \leq 1$.
17. Find the volume under the plane $z = y$ and above the region in the xy -plane bounded by the curve $x = y^2 + 1$ and the lines $y = -x$, $y = 0$ and $y = 1$.
18. Find $\iint_R x^2 + y^2 dA$ where R is the region in the plane above the x -axis and inside the spiral $r = \theta$ where $0 \leq \theta \leq \pi$.
19. Find $\int_0^2 \int_{y/2}^1 ye^{x^2} dx dy$
20. Find $\int_0^2 \int_0^{\sqrt{2x-x^2}} \frac{1}{\sqrt{x^2+y^2}} dy dx$

21. Find the volume of the pyramid above the xy -plane bounded by the planes $3x+z=12$, $-3x+z=12$, $3y+z=12$, $-3y+z=12$ and $z=0$.
22. Find $\int_0^1 \int_{\sqrt{x}}^1 \cos y^3 \, dy \, dx$
23. Let D be the region bounded by the circle $x^2 + y^2 = 2x$. Find $\iint_D (x^2 + y^2)y \, dA$
24. Find $\int_0^1 \int_0^{\sqrt{1-x^2}} x^2 + y^2 \, dy \, dx$
25. Find $\int_C x^2 y \sqrt{z} \, dz$ where C is the curve $C(t) = (t^3, t, t^2)$.
26. Let C the curve on the sides of the square, from $(0,0)$ to $(1,0)$ to $(1,1)$ to $(0,1)$ and back to $(0,0)$. Find $\oint_C e^y \, dx + 2xe^y \, dy$.
27. Find $\int_C y^2 \, dx + x \, dy$ where C is the boundary of the square bounded by the coordinate lines and the lines $x=1$ and $y=1$, oriented counter-clockwise.
28. Find the work done by the vector field $F = (y, -x)$ counter-clockwise around the region $x^2 + y^2 \leq 1$, $y \geq 1$.