

In-class exercises, Feb. 24, 2009

Maple is a useful tool for checking your work with multiple integrals. Here's one way to evaluate the integral

$$\int_0^{\sqrt{2}} \int_0^{\sqrt{2-x^2}} \int_{x^2+y^2}^2 x \, dz \, dy \, dx,$$

discussed in Example 5 on p. 361. (The percent sign % is a shorthand for the most recently computed result.)

```
f := x;    the integrand
int(f, z = x^2 + y^2 .. 2);
int(%, y = 0 .. sqrt(2-x^2));
int(%, x = 0 .. sqrt(2));
```

These problems are from Sections 5.4 and 5.5.

1. (Problem 10, p. 354) Evaluate $\iint_D e^{x-y} dA$, where D is the interior of the triangle with vertices $(0,0)$, $(1,3)$, and $(2,2)$.
2. (Problem 12, p. 354) Suppose f is a continuous function. Sketch the region D represented by the iterated integral

$$\int_0^1 \int_{x^2}^x f(x,y) \, dy \, dx$$

and interchange the order of integration.

3. (Problem 9, p. 364) Find the volume of the region bounded by $z = x^2 + y^2$ and $z = 10 - x^2 - 2y^2$.
4. (Problem 15, p. 364) Evaluate $\iiint_D (x^2 + y^2 + z^2) dV$ where D is the domain bounded by the planes $x = 0$, $y = 0$, $z = 0$, and $x + y + z = a$ (where $a > 0$).