1. Find the integral $\iint_R \frac{y\cos y}{x}\, dA$, where $R = \{(x,y)|\, 1 \le x \le e^4, 0 \le y \le \pi/2\}$.

2. Evaluate $\iint_D \frac{y}{\sqrt{1+x^2}}\, dA$ where D is the region in the first quadrant bounded by $x = y^2$, $x = 4$, $y = 0$.

3. Evaluate $\int\int_R y^2 \sin\frac{xy}{2} dA$ where R is the region bounded by $x = 0$, $y = \sqrt{\pi}$, $y = x$.

4. Evaluate $\int_0^2 \int_{y/2}^1 e^{x^2}\, dx\, dy$ by reversing the order of integration.

5. Evaluate $\int_0^1 \int_{2x^2}^2 x^3 \sin y^3\, dy\, dx$.

6. Graph the region and change the order of integration.
   a) $\int_0^1 \int_0^{x^3} f(x,y) dy\, dx + \int_1^2 \int_0^{2-x} f(x,y) dy dx$
   b) $\int_0^1 \int_0^{\sqrt{y}} f(x,y) dx dy + \int_1^{\sqrt{2}} \int_0^{\sqrt{2-y^2}} f(x,y) dx dy$

7. Let the region D be the parallelogram with the vertices $(0,0)$, $(1,2)$, $(5,4)$, and $(4,2)$. Write the double integral $\iint_D f(x,y)\, dA$ as a sum of iterated integrals (with the least number of terms).

8. Sketch the region bounded by $y^2 = 2x$ (or $x = \frac{y^2}{2}$), the line $x+y = 4$ and the x-axis, in the first quadrant. Find the area of the region using a double integral.

9. Describe the solid which volume is given by the integral $\int_0^2 \int_{y^2}^4 (x^2+y^2) dx\, dy$ and find the volume.

10. Find the volume of the solid bounded by
    $z = 1 + x + y,\ z = 0, x + y = 1, x = 0, y = 0.$

11. Sketch the curve $r^2 = \cos 2\theta$. Find the area inside the curve.

12. Use a double integral in polar coordinates to evaluate the area of the region inside the circle $r = 4\sin\theta$ and outside the circle $r = 2$.

13. Use polar coordinates to evaluate

$$\int_{-1}^1 \int_{-\sqrt{1-y^2}}^{\sqrt{1-y^2}} \ln(x^2+y^2+1)\, dx dy$$

14. Find the volume of the solid bounded by the surfaces

$$z = \sqrt{64 - x^2 - y^2} \text{ and } z = \frac{1}{12}(x^2+y^2)$$

15. Express the integral $\iiint_E f(x,y,z) dV$ as an iterated integral in six different ways, where E is the solid bounded by the surfaces $y = x^2$, $z = 0$, $y + 2z = 4$.