Math 250 Double Integral Practice

1. Evaluate $\int_0^1 \int_{x-1}^0 \frac{2y}{x+1}\, dy\, dx$
2. Evaluate $\iint_D dA$, where $D = \{(x,y) | 1 \le y \le 2, y \le x \le y^3\}$ $(\frac{9}{4})$
3. Evaluate $\iint_D \frac{1}{x}\, dA$, where $D = \{(x,y) | 1 \le y \le e, y^2 \le x \le y^4\}$ (2)
4. Evaluate $\iint_D x \cos y\, dA$, where D is bounded by $y = 0, y = x^2, x = 1$ $(\frac{1-\cos 1}{2})$
5. * Evaluate $\iint_D 4y^3\, dA$, where D is bounded by $y = x - 6, y^2 = x$ $(\frac{500}{3})$
6. Find the volume of the solid under the paraboloid $z = x^2 + y^2$ and above the region bounded by $y = x^2$ and $x = y^2$. $(\frac{6}{35})$
7. Find the volume of the solid bounded by the cylinder $x^2 + z^2 = 9$ and the planes $x = 0$, $y = 0$, $z = 0$, $x + 2y = 2$ in the first octant. $(\frac{1}{6}(11\sqrt{5} - 27))$
8. Find the volume of the solid bounded by the cylinders $x^2 + y^2 = r^2$ and $y^2 + z^2 = r^2$.
9. Sketch the region of integration and change the order of integration:
   (a) $\int_0^{\pi/2} \int_0^{\sin x} f(x,y)\, dy\, dx$
   (b) $\int_1^2 \int_0^{\ln x} f(x,y)\, dy\, dx$
   (c) $\int_0^1 \int_{y^2}^{2-y} f(x,y)\, dx\, dy$
   (d) $\int_0^1 \int_{\arctan x}^{\pi/4} f(x,y)\, dy\, dx$
10. Evaluate the integrals by reversing the order of integration
    (a) $\int_0^1 \int_{3y}^3 e^{x^2}\, dx\, dy$ $(\frac{e^9-1}{6})$
    (b) $\int_0^3 \int_{y^2}^9 y \cos(x^2)\, dx\, dy$ $(\frac{1}{4}\sin 81)$
    (c) * $\int_0^1 \int_{\arcsin y}^{\pi/2} \cos x \sqrt{1 + \cos^2 x}\, dx\, dy$ $(\frac{2\sqrt{2}-1}{3})$
    (d) $\int_0^8 \int_{\sqrt[3]{y}}^2 e^{x^4}\, dx\, dy$
11. * Evaluate $\iint_D xy\, dA$, where D is bounded by $x = -1, y = 1 + x^2, x = 1, x = y^2, y = -1$