

EXERCISES

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1. Evaluate.

(a) $\int_0^1 [\int_0^x \frac{1}{1+x^4} dy] dx.$

(b) $\int_0^4 [\int_0^y 3\sqrt{y^2 + 9} dx] dy.$

(c) $\int_0^{\frac{\pi}{2}} [\int_0^{\cos x} y dy] dx.$

(d) $\int_1^{e^3} [\int_0^{\frac{1}{y}} e^{xy} dx] dy.$

(e) $\int_1^3 [\int_0^{\ln y} ye^x dx] dy.$

(f) $\int_0^1 [\int_0^x (x+y)^2 dy] dx.$

2. Find the volume above the xy -plane bounded by the paraboloid $z = x^2 + y^2$ and the planes $x = \pm 3$, $y = \pm 5$.3. Find the volume under the plane $z = x + 2y$ and over the rectangle $R = \{(x, y) : 1 \leq x \leq 2 \text{ and } 3 \leq y \leq 5\}$.4. Find the volume of the solid bounded by the coordinate planes, the planes $x = 1$ and $y = 2$, and the surface $2z = xy$.5. Consider $\int_0^1 [\int_x^1 \sin y^2 dy] dx.$

(a) Sketch the region over which the integral extends.

(b) change the order of integration.

6. The same instructions as given in Problem 5 above. Do the following.

(Note that the answers to (a)-(j) are given in Handout #1)

(a) $\int_0^1 [\int_y^1 \frac{1}{1+x^4} dx] dy.$

(b) $\int_0^3 [\int_{x^2}^{2x+3} x dy] dx.$

(c) $\int_0^1 [\int_{x^2}^{x^2} (2x + 2y) dy] dx.$

(d) $\int_0^4 [\int_0^y 3\sqrt{y^2 + 9} dx] dy.$

(e) $\int_1^2 [\int_{y^2}^{y^3} dx] dy.$

(f) $\int_0^{\frac{\pi}{2}} [\int_0^{\cos x} y dy] dx.$

(g) $\int_1^{e^3} [\int_0^{\frac{1}{y}} e^{xy} dx] dy.$

(h) $\int_1^3 [\int_0^{\ln y} ye^x dx] dy.$

(i) $\int_0^1 [\int_{-\sqrt{1-y^2}}^{\sqrt{1-y^2}} y dx] dy.$

(j) $\int_0^\pi [\int_0^x x \cos y dy] dx.$

7. Evaluate $\int \int_D x^2 dx dy$, where D is the region bounded by the lines $y = x$, $y = 2x$ and $x = 2$.8. Set up a double integral that computes the volume above the xy -plane bounded by the cylinder $x^2 + y^2 = 1$ and the plane $x + y + z = 2$.

9. Set up a double integral that computes the volume above the xy -plane bounded by the cylinder $y = 4 - x^2$ and the planes $y = 3x$ and $z = x + 4$.
10. Set up a double integral that computes the volume above the xy -plane bounded by the cylinder $x^2 + y^2 = 9$ and the paraboloid $3z = x^2 + y^2$.
11. Set up a double integral that computes the volume of the solid in the first octant bounded by the cylinder $4y = x^2$ and the planes $x = 0$, $z = 0$, $y = 4$, and $x - y + 2z = 2$.
(Note that the answers to 8-11 are given in Handout #1)