Score: ____________

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Review Worksheet - Chapter 15 + Lagrange multipliers

Math 2110Q – Fall 2014

Professor Hohn

You must show all of your work to receive full credit!
Answer (in no particular order):

$$176, \frac{8}{15}, e-2, \frac{1}{4}, -\ln(2), \frac{1}{3}(2^{3/2}-1), \frac{\pi}{6}, \frac{13}{24}, \frac{64\pi}{9}, \sqrt{2}, 16, \frac{1}{4}(e-1), -\sqrt{2}, 12\pi$$

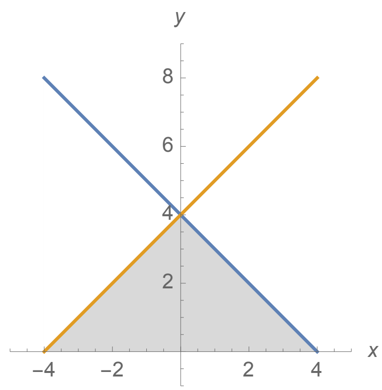
1. Calculate the integral

$$\int_0^1 \int_0^1 y e^{xy} \, dx \, dy.$$

2. Calculate the integral

$$\int_0^1 \int_0^y \int_x^1 6xyz\, dz\, dx\, dy.$$

3. Write $\iint_R f(x, y)\, dA$ as an iterated integral where R is the region described below.



Check your answer by letting $f(x, y) = 1$.

4. Set up an integral

$$\iint_D x\, dA$$

where D is the region in the first quadrant that lies between $x^2 + y^2 = 1$ and $x^2 + y^2 = 2$.

5. Set up an integral

$$\iiint\limits_E z\, dV$$

where E is the region bounded by $y = 0, z = 0, x + y = 2$ and $y^2 + z^2 = 1$ in the first octant.

6. Set up an integral to find the volume of the solid bounded by $x^2 + y^2 = 4$, $z = 0$, and $y + z = 3$.

7. Set up an integral to find the volume of the solid under the paraboloid $z = x^2 + 4y^2$ and about the rectangle $R = [0, 2] \times [1, 4]$.

8. Set up an integral to find the volume of the solid above the paraboloid $z = x^2 + y^2$ and below the half cone $z = \sqrt{x^2 + y^2}$.

9. Convert the following integral into an integral with spherical coordinates.

$$\int_{-2}^{2}\int_{0}^{\sqrt{4-y^2}}\int_{-\sqrt{4-x^2-y^2}}^{\sqrt{4-x^2-y^2}} y^2\sqrt{x^2+y^2+z^2}\,dz\,dx\,dy$$

10. Rewrite the integral

$$\int_{-1}^{1} \int_{x^2}^{1} \int_{0}^{1-y} f(x, y, z)\, dz\, dy\, dx$$

as an iterated integral in the order $dx\, dy\, dz$. Check your answer by integrating using the function $f(x, y, z) = 1$.

11. Calculate the integral below by first reversing the order of integration.

$$\int_0^1 \int_{\sqrt{y}}^1 \frac{ye^{x^2}}{x^3}\, dx\, dy$$

12. Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = \frac{1}{x} + \frac{1}{y}$, subject to the constraint $\frac{1}{x^2} + \frac{1}{y^2} = 1$.

13. Bonus: Use the transformation $u = x - y$, $v = x + y$ to evaluate

$$\iint\limits_R \frac{x-y}{x+y}\, dA$$

where R is the square with vertices $(0, 2), (1, 1), (2, 2)$, and $(1, 3)$.