Same instructions as in Mission 1. See Mission 1 for details.

Problem 76 Your PRINTED NAME below indicates you have:

(a.) I have read Chapter 6 of Cook: _____.

(b.) I have attempted 10 problems either from Stewart(see below) or the end of chapter problems in my notes:_____.

§ 15.1 #'s 15, 17, 23, 27, 29, 31, 33, 35, 37, 39, 41, 43, 47, 49

§ 15.2 #'s 3, 5, 7, 9, 13, 15, 17, 21, 23, 25, 27, 29, 31, 39, 45, 49, 51, 55, 65

§ 15.3 #'s 7, 9, 11, 13, 15, 17, 21, 25, 27, 29, 31, 37

§ 15.4 #'s 3, 5, 7, 17, 27

§ 15.6 #'s 3, 5, 7, 9, 11, 13, 15, 17, 21, 33, 35, 41, 53

§ 15.7 #'s 1, 3, 5, 7, 9, 11, 17, 19, 21, 23, 29

§ 15.8 #'s 1, 3, 5, 7, 9, 11, 13, 17, 19, 21, 23, 25, 27, 35, 41, 43, 48

§ 15.9 #'s 1, 3, 5, 17, 19, 21

Problem 77 Calculate $\int_0^1 \int_x^{x^3} y^2 \, dy \, dx$

Problem 78 Calculate $\int_0^1 \int_0^x \int_{x^2+y^2}^{x^3+y^3} 2z \, dz \, dy \, dx$

Problem 79 Let $f(x, y) = x^2 + y^3$. Find the average of f on the square $[0, 1] \times [0, 1]$.

Problem 80 Reverse the order of integration in order to calculate the following integral:

$$\int_0^1 \int_y^1 \frac{2}{1+x^4} \, dx \, dy.$$

Problem 81 Let B be the solid region bounded by $x = 0$, $y = 0$, $z = 0$ and the plane $2x + 2y - 3z = 1$. Calculate the volume of B.

Problem 82 Let R be the regions in quadrant I bounded by $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$ and $y = x$ and $y = 3x$. Calculate $\iint_R \sqrt{x^2 + y^2} \, dA$ by changing the integration to polar coordinates.

Problem 83 Find the volume bounded by the cylinder $x^2 + y^2 = 1$ and $z = 2 + x + y$ and $z = 1$.

Problem 84 Let B be a ball of radius R centered at the origin. Calculate $\iiint_B e^{-\rho^3} \, dV$.

Problem 85 Find the centroid of the region bounded by $r = 4 \cos \theta$ and $r = 2$.

Problem 86 Suppose the density of a solid sphere B of radius R is given by $\delta = \alpha\rho^c$ where α, c are constants and $\rho = \sqrt{x^2+y^2+z^2}$. The units of the constants are chosen as to give $\delta = \frac{dm}{dV}$ units of mass per volume. The moment of intertia with respect to the z axis is given by $I = \iiint_B r^2 \delta dV$ where $r^2 = x^2 + y^2$. Calculate I as a function of the constants c and α.

Problem 87 Calculate $\displaystyle\int_{-3}^{3}\int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}} \left(12 - x^2 - y^2 - \sqrt{x^2+y^2}\right)\, dy\, dx$ by changing to an integral in polar coordinates.

Problem 88 Let P be the parallelogram with vertices $(0,0), (0,1), (2,4), (2,5)$. Calculate

$$\iint_P \sqrt{2x(y-2x)}\, dA$$

by making a substitution of $x = 2u$ and $y - 2x = v$. Notice, this substitution changes P to $[0,1]\times[0,1]$ in u, v space. Thanks to Brigg's and Cochran section 14.7 for this example.

Problem 89 Use the Jacobian to relate the volume element $du\, d\phi\, d\theta$ to the Cartesian volume element $dx\, dy\, dz$ given that

$$x = u\cos\theta\cosh\phi, \qquad y = u\sin\theta\cosh\phi, \qquad z = u\sinh\phi.$$

Problem 90 Calculate the hypervolume of the set $\{(x,y,z,t) \mid x^2+y^2+z^2+t^2 \leq 1\}$