32B Killip Homework 3 Due Friday Jan 26

(1) From Section 16.3: 38.

(2) Consider the pyramid P whose base is the square with corners $(\pm 1, \pm 1, 0)$ and whose apex lies at $(0, 0, 1)$.
(a) Determine the volume of P by performing a triple integral.
(b) Check your answer against the claimed rule "one third base times height".
(c) Determine the average value of $f(x, y, z) = z$ over P.

(3) Rewrite

$$\int_0^3 \int_0^{3-z} \int_0^{yz} f(x, y, z)\, dx\, dy\, dz$$

as an iterated integral $dz\, dy\, dx$.

(4) From Section 16.4: 12, 20, 37, 54, 56.

(5) Let T be the torus given in spherical polar coordinates by the equation $\rho \leq \sin\phi$.
(a) Draw the intersection of the torus with the plane $y = 0$. (I want a two dimensional sketch on axes marked 'x' and 'z'.)
(b) Calculate the volume of the torus.

(6) Consider the region inside the cone $x^2 + y^2 \leq z^2$ with $z \geq 0$ and below the plane $z = 1 - \frac{1}{2}y$.
(a) Write the integral of $f(x, y, z)$ over this region in spherical coordinates.
(b) Repeat part (a) with cylindrical coordinates.